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THE  
THIRTY-FOURTH YEARBOOK  
OF THE  
NATIONAL SOCIETY FOR THE STUDY  
OF EDUCATION  
  
**EDUCATIONAL DIAGNOSIS**

*Prepared by the Society's Committee on  
Educational Diagnosis*

Leo J. Brueckner (Chairman), Guy T. Buswell, Willard C. Olson, Paul T. Rankin  
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THIS YEARBOOK WILL BE DISCUSSED AT THE ATLANTIC CITY MEETING OF THE  
NATIONAL SOCIETY, SATURDAY, FEBRUARY 23, AND TUESDAY  
FEBRUARY 26, 1935, 8:00 P.M.

PUBLIC SCHOOL PUBLISHING COMPANY  
BLOOMINGTON, ILLINOIS

AGENTS  
PUBLIC SCHOOL PUBLISHING COMPANY  
BLOOMINGTON, ILLINOIS  
PUBLISHERS OF ALL THE YEARBOOKS OF THE SOCIETY

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Published February, 1935  
First Printing, 8,000 copies

Printed by the  
PLIMPTON PRESS  
Norwood, Massachusetts

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FOR 1934-5

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*EDITOR'S PREFACE*

jectives in some of these areas of educational effort are less well-defined; consequently both diagnosis and remediation are not so well developed as in the more conventional areas. Indeed, they are not by any means so easy. The editor is impressed with the service that the contributors to the Yearbook have done us, in this Section of the volume particularly, by showing the essential obscurity of many of the objectives with which the pages of courses of study nowadays are peppered — terms like 'appreciations,' 'attitudes,' 'insights,' 'character,' 'personality,' and the like. It is precisely when the worker in education tries to measure the efficiency of a given educational activity in attaining such fine-sounding 'objectives' that he discovers that the propounders of these objectives are neither individually clear nor agreed among themselves as to what they are trying to produce and to measure. The Yearbook ought to serve a real purpose by stimulating precision and objectivity, and otherwise clarifying this cloudy educational sector.

G. M. W.

## INTRODUCTION

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### I. THE NEED OF EDUCATIONAL DIAGNOSIS

The committee on special education of the White House Conference on Child Health and Protection estimated that there are 3,000,000 mentally and physically handicapped children in the schools of the nation. These individuals are found at all levels of schooling, from the nursery school through the college and university. To mitigate or correct their faults and to transform these individuals from social liabilities into assets, in many cases a special type of developmental and remedial instruction is required. To this large number of handicapped may be added the thousands of children, mentally and physically normal, who are maladjusted socially, morally, or emotionally. Sheer educational neglect has resulted in the retention of this vast army of maladjusted children in the regular grades. The attempt to force these deviating children into a common mold has led to all sorts of mental and emotional twists and personality maladjustments that contribute to delinquency and social inadequacy. It is being recognized that the state must provide skilled instruction and treatment for these handicapped children as a matter of enlightened self-interest.

It is commonly recognized that many children who suffer no actual physical or mental handicaps are performing on a level considerably below their normal expectancy. Furthermore, because of inadequate stimulation many latent talents and special aptitudes are never given expression. The school must give as much attention to the development of these strengths as to the correction of deficiencies.

The school is the logical center for both skilled developmental instruction and remedial instruction. By developmental instruction we mean the provision for educative experiences that will lead to the well-rounded growth of all individuals. By remedial instruction we mean the types of corrective measures that must be undertaken to remove interferences and to remedy handicaps that prevent optimal growth.

## II. THE MEANING OF DIAGNOSIS

Educational diagnosis relates to the techniques by which one discovers and evaluates both strengths and weaknesses of the individual as a basis for more effective guidance. Diagnosis is a logical process based on a consideration of all the available data concerning a particular individual or group of individuals. The analysis of these data and their interpretation in the light of knowledge gained from past experience enables the diagnostician to suggest necessary developmental or remedial measures. Diagnosis leads to prognosis; that is, to the prediction of the probable outcome of the condition.

The procedures of medicine suggest the approach to educational diagnosis. Much has been learned concerning the causes of physical disease; the symptoms of various types of difficulties have been carefully cataloged and verified; precise techniques for evaluating their severity have been devised; systematic studies have led to the discovery of means of preventing as well as of curing many diseases. Because of the large increase in recent years of mental disorders and emotional maladjustments that are intimately associated with the learning or growth process, medicine and psychology have given intensive consideration to their diagnosis and correction. Much less is known concerning the precise causes of mental disorders than about the causes of physical disease and malfunctioning. The future development of precise techniques for analyzing the symptoms of mental and emotional maladjustments similar to those that have been devised for the diagnosis of disease will make possible the discovery of the causes of these disorders, so that effective steps may be taken to develop corrective and remedial procedures. Considerable progress in the diagnosis of mental disorders has been made in the past few decades through the discovery of their close relation to disturbances in the physiological mechanism, such as malfunctioning of glands, toxic conditions, and diseases, like syphilis, that attack the brain centers.

The close relation between diagnosis in medicine and educational diagnosis is due to the fact that learning or growth results from the play of environmental influences, consisting of matter and energy, on the physiological mechanism. This mechanism has tendencies to act and grow in ways that are definite but that vary from individual to individual on account of differences in inborn, original nature. Physical growth is conditioned by the nutrition of the individual as well as by his inherited tendencies. The normal physical growth curve is affected

by environmental conditions, such as unsanitary living quarters, exposure to disease, lack of sunshine, and the like. Mental development depends on both the potentialities of the mechanism and the experiences in which the individual participates. Only when the sense organs receive correct impressions can correct connections be formed, provided that the impressions are transmitted in a normal way by the nervous mechanism. For example, correctness of visual imagery in reading depends on the correctness of the image transmitted through the eye. When the eye has defects, reading difficulties are likely to arise. Similarly, auditory defects lead to incorrect auditory ideas and hence to faulty speech. Not the least important causes of faulty connections of deep social significance are incorrect ideas transmitted from the printed page through the eye or false beliefs promulgated by propaganda transmitted through the ear. The effects of the many uncontrolled, often unwholesome, experiences that play on the physiological mechanism contribute just as definitely to moral, social, and emotional maladjustment as faulty nutrition contributes to physical deficiency. Society faces the double problem of devising methods of eliminating unwholesome physical, mental, emotional, and environmental conditions and of directing the educative experiences of youth into desirable channels.

### III. EDUCATIONAL AGENCIES CONCERNED WITH DIAGNOSIS AND CORRECTION

In this developmental program the schools must take a major part. The school has long recognized the necessity of making special provision for the physically and mentally handicapped children, the crippled, the blind, and the deaf. Many schools now provide fairly adequate health service for all children. In practically all large school systems there are classes for the mentally retarded. Many schools have established classes for speech defectives. In recent years in a few cities there have been established child guidance clinics that deal with the child who is emotionally maladjusted or whose behavior reveals antisocial tendencies. These clinics coöperate with legal authorities in the study of factors contributing to juvenile delinquency. The rapid development of these special agencies that deal with aspects of growth formerly given little consideration by the school shows the extent to which the school is assuming some responsibility for the correction of maladjustments of all kinds that interfere with the optimal growth of all learners. All these agencies require the services of persons

with special types of training, some of them of a highly technical kind. In schools where these agencies are lacking, the teacher must assume the responsibility of dealing with the conditions.

The segregation of the physically and mentally handicapped in special classes and schools has greatly simplified the work of the teachers of pupils who do not fall into these categories. However, the wide range in the various abilities of pupils considered as normal and the differences in the rates at which they learn still present many problems. To reduce the range in the mental level of pupils in a grade, various methods have been devised for classifying them into more homogeneous groups, *e.g.*, on the basis of intelligence tests. In some schools the work of all groups is the same, save that superior groups complete the work in less time than the average or inferior groups. In other schools the work of superior pupils is enriched while the inferior groups study the "minimum essentials," during the same time. In other schools adjustments are made in methods of teaching. Other variations in time, content, and method are found in the schools.

Experience with ability-grouping has made it clear that all pupils of a given level of ability do not learn at the same rate and that marked differences exist in their interests, the difficulties they encounter, and the amount of practice they require in learning specific skills. Recent research has also demonstrated the unevenness of the level to which the various mental traits of a single individual are developed. The analysis of intelligence into its intellectual, social, and mechanical phases, as proposed by Thorndike, and the study of their interrelationships show that most individuals do not have the same level of capacity in all three aspects of intellect. For example, a child of superior intellectual capacity may be inferior in social or in mechanical intelligence; conversely, a child of high mechanical ability may be low in intellectual and social intelligence. Furthermore, from time to time, owing to the introduction of unforeseen factors, such as absence due to disease, injury, and the like, the growth of ability is retarded, so that when the child returns to school special adjustments of various kinds are necessary. Ability-grouping clearly does not eliminate the need of making a careful study of the growth of all individuals, especially if the whole personality of the learner, including his physical, mental, social, moral, and emotional characteristics, is to be given adequate consideration.

#### IV. CONTRAST BETWEEN MEDICAL AND EDUCATIONAL DIAGNOSIS

In certain important respects diagnosis in medicine and education are different. While diagnosis in medicine is to some extent concerned with the building of strengths, under ordinary conditions medicine is concerned with pathological conditions, with injury and disease. In educational diagnosis we are concerned with the analysis of all factors that condition or interfere with normal learning. An example of the differences in the points of view of medical and educational diagnosis is the ways in which the eye is considered in each case. The ordinary medical examination tests for acuity of vision and the presence of disease. This information is of course important in educational diagnosis. However, there are other facts concerning the eye that are very necessary in the diagnosis of reading disability, but with which the medical examiner is usually little concerned. Selzer,<sup>1</sup> for example, found that "over 90 percent" of the reading disability cases he examined had eye-muscle imbalance; that is, lack of balance of the muscles controlling the rotation and movement of the eyeballs. This condition makes for variability and uncertainty of perception of word forms that in turn lead to confusion and delay in the recall of words in reading. Suspenopsia, momentary blindness in one or both eyes — and alternating vision — alternating periods of vision in one eye at a time — result in lack of visual fusion, which is one of the basal causes of faulty word recognition. These two conditions do not seriously interfere with the vision required for ordinary activities, but in such specialized tasks as reading they are severe handicaps. Two very common faults in reading; namely, reversals of words, as reading "ton" for "not," and alterations in the sequence of letters, as reading "framing" for "farming," are apparently associated with lateral dominance. Reversals are apparently associated with left-eyedness and left-handedness. Alterations are apparently associated with deviations from usual lateral dominance, such as ambidexterity of hand and eye, change of eyedness and handedness, and a combination of left-eyedness and right-handedness or of right-eyedness and left-handedness. Selzer believes that lack of visual dominance is also responsible for mirror-writing, stuttering, and other language difficulties.

Studies have shown the significance of the character of eye movements as a symptom of poor reading habits. When one realizes the

<sup>1</sup> L. N. Selzer. "Lateral Dominance and Visual Fusion." *Harvard Educational Monograph*, No. 12. Harvard University Press.

relationship between muscular control of the eye and the acquired ability to move the eye from left to right in short rhythmic movements, as is done in reading, the necessity of supplementing the ordinary medical examination of the eye by techniques that analyze these muscular controls is clear. Faulty eye movements in reading are not due to disease or other pathological causes of concern to medicine; they are in part due to muscular incoordination, in part to the operation of subtle factors, such as lateral dominance, concerning which we know relatively little. Inability to read may thus in many cases be due to ineffective controls of the eye rather than to lack of mental ability, the usual explanation of failure to learn to read. Thus, the medical man is little concerned with such aspects of learning as the nature of eye movements in reading, though that is a physiological element of great significance in educational diagnosis.

Medical diagnosis usually deals with a specific condition that can be described on the basis of past experience because of its similarity to other cases. The causes of a pathological condition are in many cases definitely known and prognosis is possible. The cause of a pathological condition is often quite specific; for example, it may be a particular kind of germ, the breakdown of some organ of the body, or some specific nutritional deficiency. Medicine has been able to isolate these factors and to devise corrective and remedial treatment for many of them. Diagnosis in education is faced with the problem of analyzing a unit of complex behavior to discover the influence of causes whose action cannot be observed directly. For instance, characteristics of eye movements can be noted, but the action of the controlling muscles themselves cannot be seen directly. An error in a performance like reading or spelling can be detected, but the behavior of the mental mechanism that led to the incorrect response cannot be analyzed directly.

Educational diagnosis deals with a process that is characterized by change rather than stability. The effects of each educational experience are many-sided, and they vary from individual to individual on account of differences in maturity, experience, and ability. The performance of an individual in any given situation depends on the operation of many factors, such as the degree of effort he puts forth — something that is very difficult for the examiner to control — his experience with similar situations, his understanding of what is wanted, the environmental conditions, and his interest in the activity. Our inability to control these factors and their extreme variability from

individual to individual make it very difficult to evaluate any ability. Variation in one or more of these conditions — for example, in effort put forth — results in a change in the individual's performance on a test if the same test is repeated. In all learning situations the mental and physical growth of the individual toward maturity — a continuous process of change in the growing mechanism — is an important factor. It is thus evident that educational diagnosis deals with a much more variable condition than does medical diagnosis.

#### V. BASES OF DIAGNOSIS

Just as the physician must have a well-classified knowledge of symptoms of various physical and mental ailments and a knowledge of the causes underlying them as the basis of his diagnosis, so the teacher should have a systematic knowledge of all types of learning difficulties, their symptoms, and causes in order to make a valid diagnosis of a pupil's failure to grow in desired ways at a satisfactory rate. Unfortunately there is lacking in education exact knowledge of causes of inability to learn, chiefly because in any learning situation there are so many elements that may contribute to disability. In spite of as carefully guided instruction as we are now able to give, there are pupils whose behavior reveals maladjustments of various kinds or who fail to master the subject matter and skills that are being taught. Formerly it was our practice to fail such pupils and require them to repeat the work. In recent years, many attempts have been made to meet this condition by using methods and materials that provide for individual differences.

Painstaking studies of learning difficulties and faulty reactions of pupils have made available a large amount of information helpful in educational diagnosis. We know that the native mental capacity of the pupil determines the level of difficulty of the tasks he can learn. This learning takes place through a physiological mechanism in which there may be deficiencies that interfere with effective learning. It has been demonstrated that glandular secretions, diet, and sunshine affect physical growth, but our knowledge of their effect on normal mental growth is vague. Many of the difficulties in learning are undoubtedly due to inadequacies of the materials of instruction, ineffectiveness of methods of teaching, and failure to consider individual differences. Faulty pupil attitudes toward the work of the school grow out of distaste for the work, failure to progress satisfactorily, and unwholesome personal relationships between teacher and pupil. While the school does try to

develop worthwhile social traits and attitudes of the pupils, in many cases little actual progress is made because of the undirected, and sometimes harmful, influence of environmental agencies that the school can at present do little to control.

In any single learning situation all these factors are operative in varying degrees, and it is practically impossible completely to isolate the effects of any one of them by the analytical techniques we now employ. Any diagnosis may be incorrect because of the inability or failure of the examiner to recognize the signs or symptoms of the deficiency or because of ignorance of fundamental facts concerning learning. The examiner may lack knowledge of the factors underlying the learning activity involved and of ways in which they operate or are related; he may use techniques and devices that are inadequate, careless, and unscientific. The conditions under which the examination is given may be unfavorable or may be inadequately controlled, so that the responses the pupil makes may not be those that he typically makes in the ordinary activities in which they occur, with the result that an incorrect appraisal is made; the basis on which the diagnosis is made may not be sound, owing to the fact that important items, such as some physical deficiency, may have been overlooked. Nevertheless, if teachers use reliable objective techniques of diagnosis, they can in many cases readily determine the elements in the learning situation that they should control or correct.

## VI. THE TECHNIQUES OF DIAGNOSIS

Diagnosis in medicine has been greatly facilitated by the use of objective methods of defining, analyzing, and evaluating symptoms. Where formerly the physician based his diagnosis on cursory examinations with the eye, ear, and hand, he now uses instruments such as the ophthalmoscope to aid the eye, the stethoscope to aid the ear, and the X-ray to aid the hand, for example, in the evaluation of fractures. The use of instruments of precision insures accuracy of measurement of blood pressure, temperature, and movements of the heart, body, and muscles. Chemical analysis, microscopic study, and bacteriological examination increase the reliability of diagnosis. Various types of immunity tests, such as the Schick test for diphtheria, and tests for idiosyncrasies, such as hayfever, show the possibility of diagnosis of very specific conditions. All these techniques of medical diagnosis have their place in the study of the individual.

In comparison with this medical diagnosis, it must be admitted that

the diagnosis of learning difficulties is seriously handicapped by a lack of precise methods of testing and by our ignorance of the causes of most of the difficulties. The measurement of the effects of learning experiences cannot deal directly with these effects. Measurement of ability must depend on the performance of an individual in selected test situations that research has demonstrated will give the most valid index. A score on a single test of addition, to take an instance, is not necessarily a valid measure of general ability to add, since scores on a single test represent the contributions of many factors that do not operate in the same way in all situations. The measurement of such intangibles as aptitudes, attitudes, and personality traits is even more difficult because of the exceedingly complex nature of the elements involved.

One of the most useful contributions to the diagnosis of learning difficulty is the standard test of intelligence. If one accepts the definition of intelligence as the ability to learn and assumes that these tests measure this aspect of mentality, one can readily determine the relative learning ability of an individual. If he scores low on these tests, one may say that at least one factor underlying his inability to learn may be lack of native ability. Recent studies in the field of learning show that there is more hope of teaching apparently subnormal children essential knowledge and skills than has ordinarily been thought possible. It is also known that some children of apparently superior intelligence may encounter marked learning difficulties. Lack of intelligence alone, therefore, cannot be regarded as the invariable cause of inability to learn. Often other factors are at work and they must be determined.

To determine with precision the achievement of a pupil in general and in given subjects or phases of subjects, standard tests of many kinds have been devised. These include rate tests, scaled tests, quality scales, rating scales, interview blanks, diagnostic tests, and other analytical devices. One difficulty in interpreting the results of many of the present-day tests grows out of the wide variations in the standard scores for tests of the same ability. Furthermore, many of them have such large units of measure that a single unit represents the average growth that takes place in a whole semester. At present we have practically no achievement tests that measure in fine enough units to detect progress from month to month, much less from week to week, or from day to day. That such tests are essential is obvious.

One of the findings of measurement by these achievement tests that has important bearing on diagnosis is the apparent specificity of the various skills and responses that constitute a general ability like read-

ing or arithmetic. Experiments have demonstrated that specific skills, such as rate of reading, or ability to select the main topics of paragraphs, will readily respond to corrective measures or practice without apparently affecting in any way the other skills that make up the general ability to read.

Profiles showing the comparative level of development of the various skills for individual pupils are highly irregular and uneven. This variability may be due in part to differences in training, possibly to innate differences in the individual himself, possibly to inaccuracy of the measuring instrument. The point to bear in mind is the great variability in all human performance—a phenomenon characteristic of the biological mechanism and all its manifestations. From the point of view of diagnosis, this variability in performance is obviously significant. It suggests the inadequacy of any diagnosis based on a general test of performance. It seems essential that the diagnostician use a series of reliable diagnostic tests of desired objectives of learning much more carefully constructed than any now available. The scope of these tests must include the outcomes of learning, such as interests, appreciations, personality traits, which to many are even more important than the more specific outcomes, such as knowledge and skills, that we are now able to measure.

To aid in the interpretation of the results of diagnostic tests numerous lists of the types of error and faulty responses made by pupils in spelling, composition, arithmetic, and other subjects have been laboriously compiled. The techniques used have included observation, analysis of written work, analysis of oral responses, precise laboratory procedures, and interviews. These techniques can in many cases be easily applied by the classroom teacher. Knowledge of the types of errors pupils make gives some insight into the difficulties they encounter. In some cases it has been possible to devise improvements in instructional materials that have helped to avert the incidence of these faults. However, it should be pointed out that relatively little information is available as to the real causes of these difficulties. In many cases we have helpful information concerning the seriousness of particular faults, their cruciality, which ones may be ignored, or the conditions of which they are symptoms. Very little has been done to determine whether or not there are patterns of errors that would make it possible to classify learners into groups according to their difficulties, much as the physician has learned to classify patients into groups according to patterns of symptoms of various illnesses.

In recent years there have been developed diagnostic tests to locate with a high degree of precision many of the types of faults we have learned to recognize in a vague way through observation of pupil responses. One can well believe that it may be possible to develop tests of types of learning difficulty that will be as infallible as the well-known Schick test in medicine. In education the task is more difficult than in medicine because the latter deals with fairly stable conditions, whereas learning is a changing, cumulative condition.

It is interesting to note that few of those who have made such painstaking studies of pupils' errors have investigated the extent to which a particular fault detected in the pupil's work persists. Unless an error persists, it may be merely a chance one. The fact that a pupil misses four examples of a given type in arithmetic is no assurance that he misses them all for the same reason, although studies show that in such cases there is usually present a constant error indicating a general difficulty. The interesting thing is that such constant errors are usually associated with other errors of a highly variable type. Apparently pupils make many random errors of a type difficult to explain.

The question may be raised as to the extent to which errors and learning difficulties will disappear in the natural course of events, on account of the operation of such factors as maturity, biological growth, routine teaching, and developing insight on the part of the learner. If faults disappear in the natural course of events without any diagnosis or special types of remedial attention, problems of instruction are greatly simplified. Thus, it is known that lip movements in reading tend to disappear with growth in reading ability. Knowing this, the primary-grade teacher need not be especially concerned with lip movements in reading. When lip movements in reading do persist, say to Grade IV or V, the need of diagnostic measures and remedial efforts is obvious. We shall greatly reduce learning difficulties as we perfect instructional procedures and materials. That we shall be able to eliminate such difficulties entirely is wholly unlikely, because of our ignorance of the various factors that condition learning and our inability to control their operation.

Laboratory findings of biochemistry show that the functioning of the mechanism of internal secretion has a direct bearing on maladjustments of many kinds, both physical and mental. Since learning is attended by some modification in the nervous mechanism, it seems likely that in many instances learning must be conditioned by the various glandular disturbances and imbalances that we know exist.

For example, it is known that stuttering is often associated with thyroid deficiency. At present, however, we know very little definitely concerning the relationship of glandular functioning and learning. Motivation, which is recognized as one of the vital elements in learning, is intimately related to emotion, which is in turn largely controlled by glandular functioning. Many interesting hypotheses on the bearing of this fact on instruction could be proposed. For instance, the variability of human performance from individual to individual and within one individual may be intimately associated with chemical changes in the constitution of the blood or with subtle forms of reaction to unknown forms of stimuli. If biochemists, with their specialized laboratory techniques, and students of learning could combine to study educational problems, there might result a series of discoveries of vital importance in educational diagnosis. This type of research would be especially helpful in getting at some of the causes of inability to learn. We have been too much concerned with the mere manifestations of difficulty through external symptoms. The time has come when we must shift to the definite attack on their causes. Much of our remedial work is ineffective because we know so little concerning causes.

#### VII. ESSENTIALS OF AN EFFECTIVE EDUCATIONAL PROGRAM

Development, remediation, and guidance are essential elements of any effective educational program. The aim of the school should be not only to correct deficiencies but also to develop the potential abilities of the individual and his special aptitudes to the fullest extent compatible with well-rounded personality. This applies to instruction of pupils of all levels of ability. In so far as is possible the school, by systematic examinations to locate factors that interfere with growth, must protect the child against those conditions which contribute to maladjustment. When the presence of unfavorable conditions is revealed, the school must take steps to determine their nature and extent, and where possible to correct them and remedy their effects. These steps will include necessary medical attention, curricular readjustments, changes in methods of teaching, improvements of the materials of instruction, the elimination of unwholesome environmental influences, and such other steps as the particular case may require.

### VIII. THE AIM OF THIS YEARBOOK

The aim of this Yearbook is to present a systematic survey of the techniques and implications of educational diagnosis. The materials are divided into five sections.

Section I contains a discussion of factors that contribute to the well-rounded growth of the individual. These factors are grouped under five heads: neurophysiological, mental, pedagogical, environmental, and emotional. A perusal of these sections will make clear the complexity of factors that contribute to learning.

Section II deals with the general principles underlying diagnostic and remedial procedures. The discussion is made concrete by presenting numerous specific illustrations of applications of the various principles. The purpose is to lay the groundwork for the remainder of the book.

Section III deals with diagnostic and remedial teaching in the basic tool subjects, reading, composition, social studies, science, and arithmetic. Here are developed the specific applications of the general principles discussed in Section II. The attention of the reader is invited to the systematic attempts that have been made to show that diagnosis must deal with all the desired outcomes of instruction in the various fields. The authors make clear the lack of standard methods of evaluating the extent to which instruction achieves many of the objectives that are now regarded as of greatest social value. Each section contains a systematic discussion of specific techniques of diagnosis, their values and limitations, a comprehensive survey of factors that condition learning, and helpful remedial suggestions. The materials are organized on a functional basis, so that the methods of dealing both with group difficulties and with individual problem cases are made clear. The remedial suggestions that are given are based on a systematic canvass of available experimental literature and include procedures that most teachers should be able to apply. It has not been possible, of course, to include as detailed remedial specifics as may be needed with extremely difficult problem cases.

Section IV deals with problems of diagnosis of less specific educational outcomes, such as health, speech, character traits, vocational aptitude, use of leisure time, and creativeness. In this section the attempt is made to suggest methods of evaluating many of the apparently less tangible outcomes of education that progressive education and the activity movement stress.<sup>1</sup> The developmental remedial suggestions

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<sup>1</sup> See *The Activity Movement*, Part I of the Thirty-Third Yearbook of this Society.

that are given represent the composite views of leading authorities in each field. The Committee is keenly aware of the lack of experimental evidence as to the value of many of these suggestions and the conflicting views of workers. The necessity of careful experimentation to discover and evaluate methods of bringing about an improvement where there are undesirable personality traits is evident.

Section V discusses briefly various administrative aspects of educational diagnosis, such as types of organization of clinical services suitable for communities of various sizes, the provisions for training teachers in the efficient uses of diagnostic techniques, the provision of the necessary tools of instruction, and the type of educational leadership essential in a well integrated program of education.

#### **IX. THE WORK OF THE COMMITTEE**

The material in this Yearbook is essentially a group product. At the first two meetings of the Committee the possible contents of the Yearbook were discussed in detail and an outline was formulated. Each member of the Committee assumed the responsibility of preparing a preliminary draft of one or more sections as the basis for a group discussion. Detailed outlines were discussed and revised at meetings in Cleveland and Columbus. Then the various sections were written. These materials were subsequently discussed at two three-day Committee meetings, one in May and another in June of last year. On the basis of numerous suggestions made at these meetings final drafts as they appear in this Yearbook were prepared. They are in a real sense the expression of the combined views of the whole Committee.

The Committee called to its assistance several specialists whose names appear over the chapters they prepared. These chapters were given the same type of critical appraisal that was given to those prepared by the members of the main Committee.

It is the hope and expectation of the Committee that the material presented will lead to greater discrimination in the use of available methods of measurement and diagnosis, the improvement of these methods, and the invention of superior methods. Their use should lead to the discovery of causes of various symptoms of faulty growth and ultimately to the discovery of remedies. Diagnostic and remedial investigations point the direction to fundamental scientific discovery in education.



## *SECTION I*

### **FACTORS ASSOCIATED WITH LEARNING DIFFICULTY**

The efficiency of learning is conditioned by many factors. Some of them can readily be analyzed; others are difficult to evaluate. These factors include the neurophysiological mechanism of the individual, his intellectual equipment, the quality and richness of the learning situation, environmental forces that play on the individual, and the ways in which he responds and reacts to them.

In any single learning situation all these factors operate in varying degrees. Failure to learn may be due to the effects of any one of these factors or to various combinations of them. By noting symptoms of faulty reactions, we can make certain inferences as to which of the factors may be the source of the difficulty.

Awareness that many factors may contribute to failure of any individual to grow mentally should lead to caution in diagnosing the difficulty. It is essential that the learner be considered from all points of view as a growing, developing personality. Because individuals differ in the ways in which the various factors operate, each learner must be considered as an individual. In so far as possible the teacher must determine the sources of difficulty, using suitable diagnostic techniques for locating them. A diagnosis growing out of a scrutiny of all available data bearing on an individual case should lead to the taking of steps to remedy the condition.

It is the purpose of Section I to present a systematic consideration of what may be regarded as the major factors associated with learning difficulties.

# CHAPTER I

## PHYSICAL CONDITIONING FACTORS IN LEARNING

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### I. LEARNING AND VARIABILITY

Let us give our imagination free rein and conceive, if we can, what life would be like if we did not possess, intrinsic to our very organization, the capacity for learning. Without this capacity there would be no art, no science, indeed, no human beings in large sections of the world where they now exist fairly comfortably. There would be neither libraries, houses, nor clothing; fire, implements of all kinds, and organized warfare would be non-existent; man, if he were able to survive at all, would, like the insects, be dependent upon fairly rigid instinctive mechanisms.

Such acquisitions, or creations, as those listed above are but a few of the social accretions that man has laboriously gained through the ages. Not only has he acquired these but, what is more important, through the invention of writing and speech he also has transmitted them to subsequent generations. It is this acquisitive tendency, made possible through the capacity to retain impressions, that is the basis of the activity we designate as learning.

Learning itself is not a capacity; rather, it is an activity, and it can only be understood by an examination of the particular conditions that bring out or influence the activity. These conditioning factors are of many kinds. Some of them are distinctly residual to the animal's internal economy — thyroid deficiency, for instance, clearly influences learning rate and degree — but there are other factors lying without the organism which are capable of exerting profound effect. An example of such would be competing stimuli or distractions in the course of learning.

But there is nothing compelling in external stimuli unless they disturb the state of equilibrium. If this happens, adaptation becomes necessary, and if adaptation is not possible through native behavior responses, a new manner of responding must develop. The penalty of failure to adjust to a crucial demand is annihilation.

Without capacity for adjustment, or variation in behavior, survival is hardly conceivable, since environments are seldom so constant that new adjustments are unnecessary. The individual is constantly adapting to needs; and all those structures capable of functional variation are, in their very nature, characterized not by a rigid but by a labile organization. Regarded in this light, the capacity for learning appears to be but another aspect of that principle, variation, which nature has so lavishly employed. In learning we find one of the most strategic and important adjustment mechanisms. It cannot rightly be regarded as an isolated and specialized kind of psychological phenomenon. Instead it is basic to the most primary survival demands.

Learning is quite as precisely descriptive of an organic process as are such terms as calcium metabolism, oxygen exchange, and water balance. In fact, from one standpoint learning does not differ materially from these other processes. Calcium metabolism and oxygen-exchange rate vary in reference to the needs of the animal, and with available sources of supply equilibrium is quickly restored. On the other hand, in the presence of scarcity the organism undertakes frantic attempts at adjustment.

In similar fashion the increased precision in adjustment made possible through learning is unnecessary, and hence not accomplished, if the individual finds his needs quickly and easily satisfied. But in a universe one of whose fundamental motifs is conflict, the organism is forever being required to adjust to new and strange circumstances. The ability to draw upon the experience of the past and to focus that experience upon the needs of the present constitutes a tremendously potent weapon against the inexorability of a savage universe.

The dependence of the higher animal upon the information collected through the process of learning is almost as complete as its dependence upon those other mechanisms necessary to life and health. This fact suggests a unity in biological integration, and, as a consequence, no treatment of learning is adequate if that treatment attempts to survey and evaluate from the purely functional or psychological influencing factors. In reality, learning should be regarded as an extreme example of variation in behavior potential. It is in no sense antagonistic to the structural mechanisms laid down in original nature. Rather, it supplements the general picture of variation so convincingly that, more than any other single fact, it forces the conclusion that nature abhors stability.

There is a real dynamics of living tissue, and the static implications so frequently read into the data bearing upon the mechanisms of original nature are possible only if one ignores the structural deviations present, together with their consequent functional instability. Limitations are set by both nature and nurture; patterns of conduct are determined by both, and, somehow, in the process of living, a fairly satisfactory harmony is reached between these two mighty forces. The external world, nurture, furnishes largely the stimuli or incentives; the internal one, nature, the equipment with which to utilize those stimuli to the advantage of the organism. But harmony, as an expression of natural law, does not demand simple and inflexible mechanisms. As great, and perhaps as useful, harmony is possible in mechanisms sensitively tuned to respond to multiple stimuli. Of the nature of such is the mechanism underlying learning.

This is particularly apparent if one examines learning conduct under conditions of high and low motivation. In fact, it is doubtful whether any activity reflects sensitivity to influencing agents to the degree that learning-in-process does. Unless stimulating conditions are rigidly controlled, the activity is highly variable. Even if they are rigidly controlled, one of the very essential qualities of learning-in-process is change. Each new trial must deviate from the previous trial or learning is never accomplished. The most fundamental characterizing attribute of learning is progressive and increasingly effective adjustment toward a certain end. And this, specifically, means variation from trial to trial. Out of these variations, whether they happen by *trial and error* or by *insight*, that behavior which is most economical and effective is retained to function as the pattern of conduct we call habit.

Thus it appears that any attempt to scrutinize the physical basis of learning leads in the first place to the easily identified units of structural organization. Bones, blood, glands, and nerve cells are realities in nature. Composed of matter as they are, they have certain identifying attributes in structure. These are relatively easy to examine. But attributes of structure exist largely for the reason that they make function possible. Function is a generic term applied to all the various kinds of adjustment that can be accomplished by a given structure. With some structures the functions may be highly limited in scope. And yet it is questionable whether any structure is so specifically organized that it never varies. Consider the white blood cell; its phagocytic action is the reason for its existence; yet in the grave pathology, leukemia, we find the behavior of these cells distinctly changed, pre-

sumably because of some change within themselves or within their environment.

In the presence of such phenomena as cancer and leukemia one questions whether there are any structures in the organism that cannot deviate and change their function. If this is true, then it is necessary to know not only the structure-function relationships under normal or easily satisfied conditions but also what happens under unusual conditions. And the further our knowledge of biology progresses, the more certainly does variation, as an innate attribute of tissue, stand out as one of its really identifying characteristics.

It is apparent, therefore, that no one at present is able to generalize regarding either the organization or the potentialities of cells. Correct diagnosis in behavior patterns is possible only if all of the stimulating conditions are known and if the state of the receptive organism is also completely known. Neither of these conditions is ever fulfilled in any learning study. As a consequence, workers in learning make the same error of over-generalizing their data, by reason of restricted observations, that many workers in inheritance have done in regard to restricted functional potentiality in structure. Both groups have failed to conceive of variation as primary and universal in organisms living in a highly complex and variable world.

It is for this reason that the diagnosis of learning disturbances becomes difficult. Such interferences can only be examined through a study of the manner in which particular stimuli affect the learner in the desired or observed direction. Psychology has for a long time been focusing attention upon this problem, and the result is a welter of data difficult to generalize even for purely psychological purposes.

Good as these data may be, nevertheless, they have shed little light on the fundamental question of how learning is accomplished organically in a living being. This is still a mystery to neurologists as well as to psychologists, and it is likely to remain such for a long time to come. If the biological explanation is ever discovered, it will have to account for the tremendously complex and variable factors that are now known to influence learning, such as age, sensory mode of presentation, distribution of practice, and so forth.

Although at present it is impossible to describe how learning is accomplished in the nervous system, there does exist a solid body of facts in both psychology and neurology. And in recent years there has been present a tendency for these two interdependent fields to approach and reinforce one another. An increasing number of psychologists are re-

fusing to attack the study of behavior with purely psychological techniques. On the other hand, neurologists are recognizing that the histological approach must be supplemented by precise observations on behavior. This conviction brings them face to face with the great variability and complexity of mental activity — a fact the psychologists have long recognized.

In a sense, the complexities are so decided that the problem of explaining their structural basis seems to many little more than hopeless. And yet, as one examines the data, he can hardly escape from the conclusion that certain interdependences of structure and function exist and that a few of these can be correctly stated even now. Of these, some will be examined in the succeeding pages, but before this is done it seems necessary to examine the orienting points of view and the techniques employed both by psychologists and neurologists in their attempts to unravel the structure-function problem as it relates to that somewhat arbitrarily limited type of activity that we call *mental behavior*.

## II. TRADITIONAL TECHNIQUES

Before proceeding to the facts of neurology as they relate to the question of learning it seems well to extricate learning from its traditionally isolated setting and to scrutinize the validity of the techniques that have been used to illuminate it. This is not an easy task — examination of tradition never is; on the other hand, neither is it an altogether fruitless task. For such an examination may reveal restrictions, imposed by the nature of the techniques employed, which act to hamper the progressive understanding of the field. Learning, as a department of knowledge, would indeed have to be an exception, had it escaped the man-handling from dogmatic, yet naïve, belief.

If one examines the history of various sciences, one fact stands out clearly — that the techniques that have yielded the most promising results are those devised by workers in the field and hence have specific application to the phenomena to be observed. In fact, one may well question whether real advance can be accomplished in any other way.

Psychology prides itself, and rightly so, on the mass of unique and specifically applicable techniques that it has developed for the examination of its content. To many psychologists an understanding of the physical basis of learning is not essential to generalization about behavior. They maintain that the business of psychologists is to investigate and describe mental processes by employing the special techniques of the trade. They do not deny the importance of the neural mecha-

nisms responsible for mental behavior, but on the other hand they do not believe that generalizations about mental phenomena must await or be accompanied by neurological illumination of the activities involved.

At first thought there seems to be much that can be said in favor of this purely pragmatic position. The most trenchant argument for it is that phenomena generalized through the employment of valid techniques can never be explained away by neurology but must be accounted for by it. Unless this happens, neurology will be compelled to retire in defeat.

But good as this argument sounds, it is no argument, for it sets up a straw man to demolish. Behavior is but the dynamic expression of structural integration; and knowledge of the mechanics of that integration can never conflict with valid generalization on behavior.

Can we say in good faith that the setting aside of learning as a special territory for investigation through particular techniques has fulfilled the pragmatic promise? In the affirmative it can be answered that all that we know about learning has come by this route. In the negative it can be urged that much that we don't know about learning is due to this very abstraction. There is an inherent danger in the study of behavior if no attempt is made to anchor that behavior to the structure that makes it possible. And this, specifically, is the reason why criteria of learning need to be discussed. If the criteria that we are now employing to judge learning behavior are crude and inaccurate, it is doubtful whether we can ever furnish to neurology adequate psychological facts with which to work. What is more, it is doubtful whether, even for ourselves, we will be able to satisfy the pragmatic requirement of prediction in any precise sense.

### III. CRITERIA OF LEARNING

Criteria of learning are broader than the name implies. As a matter of fact they touch, in a very real sense, many phases of activity ordinarily not included under the term learning. Pavlov in his studies on conditioning has employed them. Physiologists have approached them in their studies on compensatory mechanisms in organs, and even the mental testers have trafficked with them without being aware of what they were doing.<sup>1</sup>

Within the field of learning itself they have been accepted by most

<sup>1</sup> Kuhlman has been keenly aware of this problem. He has introduced in his revision of the Binet both *Time* and *Error* scoring as well as tests employing the *Pass-Fail* scoring.

people as given — tools are often so accepted, witness language — and this may account for the fact that criticism of them is conspicuous by its almost complete absence. However, one group of workers on learning must be exempted from this charge; they are the people working in animal psychology. Some of the animal psychologists have begun to recognize that before we can say much about learning and animal intelligence we must be more precise in our measurement of them.

Traditionally the criteria of learning have been three in number: time, errors, and trials. The people working with tests have added or adopted a fourth — the 'pass-fail' type of scoring — which may be regarded as a criterion by which to judge memory. Adherents of the gestalt group have vaguely suggested another criterion which implies that in learning behavior there are certain typical *pattern shifts* that may possibly some day be utilized to supplement time and error for judgmental purposes. But it is Pavlov who has made the most dramatic contribution in this field. He has unquestionably added a brand new criterion of learning, salivary secretion.

Under ordinary learning conditions only the first four are utilized. Even Pavlov employs them. But this does not necessarily mean that they are better under all circumstances; it could quite as well mean that psychologists are so constrained by the limits they have set for themselves that they are unable to conceive of learning as being judged by any other measures. In support of this latter contention is the fact that we have so long overlooked the great similarity of the variability inherent in learning with variability present in other organic processes. As pointed out earlier, learning expresses, in a very dramatic way, one of the most significant principles employed in organic integration. Yet our learning criteria of time, trials, and errors, although they clearly revealed range and deviation, did not lead us to identify this very apparent and emphatically present variation as the manifestation of a great principle of biological design. It remained for the physiologist, Pavlov, to furnish the data and create the criterion by which this synthesis can now be accomplished. And, strange to say, either Pavlov does not see what he has accomplished here or he is uninterested in it.<sup>1</sup>

Again, we have come to accept, almost as ultimate fact, the negatively accelerated curve as the true graphic expression of learning. Yet,

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<sup>1</sup> Ivan P. Pavlov. *Conditioned Reflexes*. (Translated and edited by G. V. Aurep. Oxford University Press. 1927.) *Lectures on Conditioned Reflexes*. (Translated by W. Horsley Gantt. International Publishers Co. 1928.)

with at least the error criterion, and perhaps the time criterion, it is doubtful whether any other curve can be gotten. True, there are exceptions such as the insight curves, but perhaps more precise measurement of insight situations will not yield curves similar to the orthodox ones. Allowing for possible exceptions, then, such as the insight curve, it can be stated with some emphasis that the curve most frequently met is the negatively accelerated one. All sorts of proposals have been offered in explanation. Only one of these has very definite support, and that is *the inherent weakness of the time and the error criteria.*

### 1. Time

Let us examine first the *time criterion*. This measure is particularly applicable to certain types of activities that, at least in part, involve learning. The training of an athlete to run a hundred-yard dash would be a case in point. Even a potentially great runner with no previous experience would, at the first attempt, make a poor record — let us say eighteen seconds. With assiduous practice through a long time he might reduce his running score to ten seconds. Certainly the curve of his improvement would be negatively accelerated. Judging this performance by the time criterion, as we do, we are assuming, if we accept this negatively accelerated curve as valid, that all seconds are equal. As units of time in themselves they are equal; but as measures of what happens in the subject they are the farthest thing from being equal.

Negative acceleration here means that as the slowing up in improvement proceeds, the effort expended increases. The reduction in time from eleven to ten seconds would require an enormous amount of training and effort in comparison to the amount of effort expended in reducing running time from eighteen to seventeen seconds. Clearly in this instance seconds are not equal as measures of biological operations. And since learning is involved in training of this sort one may well raise the question whether any learning study that utilizes time as a criterion does not merit the same suspicion.

As a measure of accomplishment, speed of performance is entitled to respect, but for quite different reasons than most people have thought. As a means for satisfying some demand, a goal or end, that has social implications, it is perfectly legitimate. Here we are observing change toward some judgmental goal. Regarded from this angle, it is not the process of attainment, so much as the degree of attainment, that interests us. On the other hand, if it is the process of attainment that is

important from our point of view, then we cannot ignore inequality of measuring units.

## 2. Error

The same criticism that has been applied to the *time criterion* holds for the *error criterion*. Every animal psychologist knows that a rat reduces errors rapidly in the beginning of learning but has great difficulty in eliminating the last few. Plotting the learning errors yields a negatively accelerated curve. Here, again, units are treated as equal; an error eliminated at the beginning of learning is given the same weight as one finally overcome after many trials. In no correct sense can the effort expended in error elimination in the two periods be treated as equal. And since in the plotting of unweighted data an error is an error, the one certain thing that can happen is a negatively accelerated curve. This being the case, negative acceleration is not entirely an expression of biological necessity, except indirectly; rather, it portrays in part the limitations of the criterion used.

The persistence with which we have looked upon this negative acceleration as an expression of physiological limits has convinced not only psychologists, but neurologists and physiologists as well, that the final neurological accounting will have to explain the phenomenon of negative acceleration in learning. This statement is not a denial of limits, physiological or otherwise; there are functional limits set for all structures. But when units are regarded as equal that obviously are not equal, one may well question whether negative acceleration is symbolic of neural functioning.

## 3. Pass-Fail

What has been said of the criteria of learning could be said with quite as much force of the territory of mental measurements. Mental tests utilize largely the pass-fail criterion. Tests measure not *learning-in-process*, but *learning-attained*. Because of this fact the pass-fail criterion is particularly convenient and usable. But it is a very gross measure and unfortunately it is always married to some kind of *average performance*. It has no capacity to reflect the various influences that may have conditioned the learning while in process. All it can do is to indicate whether the learning accomplished reached an arbitrarily set limit. Above that limit the score is 'pass,' below it is 'fail.' Pragmatically if our interest is in attainment this is legitimate. But if we expect to secure unanimity between psychology and neurology

on the structure-function problem, then we should be cautious in using data collected under this criterion, for the purpose of generalizing on any mental growth phenomenon.

Yet this is precisely what some writers on mental growth have done. The mental growth curve, as these writers present it, is a negatively accelerated curve.

These defects in the studies of learning and mental testing insist, with imp-like ingenuity, upon appearing in other territories, even in some of the neurological studies that have employed the techniques of psychology. Clearly, until psychology is able to generalize more correctly its own content, it can expect no acceptable and authentic treatment of the biological basis of mental phenomena.

But in spite of the inability to do this at present, progress is being made. Certain relationships of structure and function seem reasonably clear. We know, for instance, that poor learning ability appears in an individual suffering from thyroid deficiency. Here we have the fact of the poor mental performance, the fact of specific glandular deficiency, and we may some day know all about the neural pathology associated with it. Similarly, other correlations are known.

#### IV. PHYSICAL-MENTAL RELATIONSHIPS

Anyone who attempts to translate mental phenomena into terms of physical operation must at present recognize that he is attempting a highly unsatisfactory, if not impossible, task. We know a great deal about the factors that condition learning, but we know next to nothing about how learning is accomplished in the nervous system. That something happens during the process of reaction is clear — the fact of the changed behavior demonstrated this — but just what the nature of this physical change is, which is responsible for memory, no one at present can say.

It is possible, however, to list certain physical-mental correlations — physical states that condition mental behavior. Although these are not extensive they are useful to those interested in diagnosis. Diagnosis of learning difficulties must take into account at least some of these conditioning physical factors. Many of them are obscure and difficult to identify, and they require in most cases careful medical examination. Even when this is available, correction is not always easy and at times it is impossible.

Any condition that affects either intelligence or sensory equipment

is likely to affect learning. Usually this effect takes the form of interference rather than facilitation. The information now available deals mostly with specific factors that disturb learning.

### 1. Sensory Acuity

Of these conditioning factors, first of all must be listed the sensory equipment of the subject. It goes without saying that the child with defective vision or poor hearing is handicapped in his school performance. He needs not only a diagnosis of his difficulty, but also, if possible, correction of the defect. Acuity tests permit fairly accurate determination of the degree of the defect. Total blindness and deafness, of course, necessitate special education. But partially sighted children may labor along through many years with only thirty or forty percent vision. Any child who does poor school work from the start should, as a matter of routine, be tested for visual and auditory acuity. The teacher herself can usually make a preliminary investigation to determine whether reference to the nurse and the doctor is necessary.

Visual and auditory acuity are not in all instances traceable to sense-organ defects. There are certain pathologies that produce change in sensory behavior. It is frequently said that in the aura preceding the convulsions in epilepsy a heightened sense acuity is present. A similar state prevails in certain drug intoxications, and possibly also in the tetanoid state associated with low blood calcium. Again, thyroid deficiency seems to be characterized clinically by low sensitivity; doctors often report defective hearing in myxedema cases. In the augmentative states, such as those reported to be associated with low blood calcium, we do not yet know what is the effect upon learning. Such children are hyper-irritable, hyper-active, and probably somewhat lacking in the stability necessary to consistently good performance in learning. On the other hand, it is possible that this heightened irritability may assist them at times.

### 2. Diet

We know that certain diets are deficient in calcium. This is true of the diet of North China, and it is even reported that the American diet also is slightly deficient in calcium intake. Since diet is such a primary and universal conditioning factor in the health of children, it is quite possible that its effect in this direction is widespread. No precise data, however, are available on this topic. Studies have been

made — in the main they have yielded negative results — on the effect of diets upon intelligence. But few precise studies, other than animal studies, have been made on the relation of diet to learning.

### 3. Neural Injuries

Extensive injury to central nervous tissue naturally affects learning. Birth injury cases, although not frequent in school children, are not uncommon. These cases usually show grave defects in intelligence and in muscular coördination, sufficient in many instances to exclude their possessor from school. Central nervous tissue does not regenerate; hence the main remedial treatment possible in such cases is reëducation of muscle groups to take over the lost functions.

The degree to which central nervous tissue is specialized is still a debatable question. Clinical medicine still largely subscribes to a rather high degree of cortical localization in the human being. Lesions in the motor cortex manifest themselves by muscular paralysis in the corresponding muscle groups; occipital lobe destruction results in cortical blindness; and temporal lobe injury manifests itself in sensory aphasia — disturbance in the meaning aspect of language. The frontal lobe is held by some to be the seat of learning and intelligence.

In recent years data have been presented that test severely any concept of rigid localization. But, without going into technical details of the controversy raised by the studies of Franz, Burckhardt, Lashley, Loucks, Jacobson, Cameron, Dandy, Rockwell, Warnke, and others, it may be said that the various experiments raise the question whether results pointing to absence of cortical localization may not be partly the expression of the particular testing devices used and whether the learning problems employed have enough reliability and validity to warrant the elaborate and revolutionary generalizations that have been announced, especially by Lashley.

## V. TYPES OF MENTAL DEFICIENCY

Closely allied to the matter of brain lesions are data derived from the field of mental deficiency. Some of these, such as cretinism, will be touched upon in other sections of this paper. Space does not permit any more than a brief mention of them. Behavioristically, the various clinical types that are met, such as amaurotic family idiocy, mongolism, hydrocephalus, microcephalus, cretinism, and epilepsy, have only one thing in common — low learning potential, and as a consequence, low

intelligence. In several, if not all, of these types, clear-cut brain destruction or pathology is present.

That mentality is an expression of the integrity and organization of the higher neural tissue is no longer a mooted question. But it does not follow, as many writers have assumed, that the capacity of learning is determined entirely by the innate organization and structure of cortical cells. The inherited structural organization of brain cells is of signal importance, but so also are the conditions under which neural tissue operates. To one who carefully surveys the literature, small doubt remains of the effect upon neural functioning of external and internal environmental agencies, such as the hormones from the glands of internal secretion.

The cortical protectionists, those who subscribe to the theory of cortical isolation and dominance, have derived their theory by focusing attention upon the static and more or less constant aspects of neural operation. Yet as pointed out earlier, no more certain characterizing attribute of living tissue can be found than its potentiality for variation; and variation in function means just one thing — response to stimuli. In the very nature of the logic implied, those stimuli cannot rest within the cells themselves; they must lie without the cells and express their influence by neuro-functional deviation.

Even in some of the mental deficiencies, such as epilepsy, the evidence clearly suggests that the mental deficiency present is but another aspect of a general pathology, which, although possibly inherited, is still the result of particular causative factors. Thus, if we are to accept McQuarrie's work,<sup>1</sup> the conclusion is forced that the mental deficiency present in the *grand mal* and *petit mal* types of epilepsy is the result of disturbance in chemical balance, since the convulsions can be abolished by control of the water intake. Such data strongly suggest that high neural cells are neither isolated nor incapable of being influenced by agents powerful enough to change their state of rest.

### 1. Some Conditioning Agencies

Aside from the fact of the conditioning influence of gross brain injury and neural defect, various agencies show distinct capacity to influence activity of neural tissue. These agencies are in the main either

<sup>1</sup> I. McQuarrie and H. M. Keith. "Experimental study of acid-base equilibrium in children with idiopathic epilepsy." *Amer. Jour. Diseases of Children*, 37: February, 1929, 261-277; and I. McQuarrie. "Epilepsy in children; relationship of water balance to occurrence of seizures." *Ibid.*, 38: September, 1929, 451-467.

chemical or mechanical in character and are so distinctly different that again they have but one common characteristic — the power to compel neural tissue to deviate from its native inertia and manifest that deviation in changed behavior. Some of the more important of these stimulating agencies will be briefly discussed.

*a. Drugs.* The effect of various drugs, such as the anesthetic agents — mescal, absinthe, hashish, caffeine, curare, alcohol, etc. — upon neural tissue is known to all. These drugs cause distinct changes in behavior and some of them severely condition learning. Such is the case with absinthe, hashish, alcohol, and caffeine. The first three, in so far as we can judge from the data available, have a depressive effect upon learning. In contrast, caffeine produces a distinct facilitation in mental agility.

Although these agents are agents that seldom enter into consideration in the learning difficulties of children, they are, nevertheless, strategic in that they indicate so clearly the response of neural tissue to stimulating chemical agents and again point conclusively to the sensitivity, rather than the lack of sensitivity, of neural tissue to intrinsic and extrinsic stimuli.

*b. Toxins.* Similar to drugs are the various toxins, either extraneous agents introduced into the organism or intrinsic agents produced within the organism. Many of them are the result of a specific infection; some are produced by a deranged metabolism. Such agents as the germ of syphilis and of lead-poisoning condition behavior even in the case of the offspring. Lead-poisoning affects fetal development; and congenital syphilis, if untreated, does not offer the best of prognoses.

Much the same can be said of various other toxic agents, such as carbon monoxide poisoning, chronic infections from tonsils, teeth, etc., and of disturbances resulting from specific illnesses, such as tuberculosis and states of disturbed metabolism. In advanced diabetes, for instance, certain ketone bodies are produced that have a toxic and depressive effect upon neural tissue.

All these factors may be encountered in public-school children, and, if present, condition their performance. Their diagnosis, of course, can be made only by the medical staff, and this fact constitutes a further reason why all poor achievers in school should be carefully scrutinized by medical and psychological consultants.

*c. The Vitamins.* In the vitamins, again we have agents that distinctly affect neural performance and, contrary to the belief of many laymen, vitamin deficiency is not uncommon. Only three of the

vitamins will be discussed here—A, B, and D. Vitamin A is present in unusual concentration in the eye. Just why the concentration in the eye is not clear, but it is quite possible that vitamin A influences visual performance, even to the extent of the quality of school work. Research on this aspect of the problem is entirely lacking.

Vitamin B deficiency, or beri-beri, among its various symptoms, is characterized by a severe neuritis, clearly indicating neural involvement. Maurer and Tsai<sup>1</sup> have studied the effect of vitamin B deficiency on rats and report superior learning in animals not suffering from deficiency of this agent. Maurer and Balken<sup>2</sup> have recently conducted a research on the therapeutic effect of vitamin B administration to children that show deficiency in it and report distinct changes in behavior, both muscular and mental.

Vitamin D is intimately linked with metabolism of calcium and phosphorus, which also seems to be influenced by the function of the parathyroid glands. Low blood calcium manifests itself by an increasing irritability that may culminate in violent convulsions. Since convulsions are indicative of neural pathology, we have here the case of a specific agent, calcium, that effectively conditions neural operation. In contrast to sodium chloride (table salt), which is a neural irritant, calcium is a neural depressant. In one sense it keeps neural tissue within bounds and, acting as a buffer, gives a degree of flexibility to neural tissue. This is but another of nature's mechanisms for variable performance.

Certain clear-cut psychological phenomena are traceable to calcium disturbance. The work of E. R. and W. Jensch<sup>3</sup> bears on this point. These men have identified in the tetanoid condition the psychological phenomenon of eidetic imagery. Essentially the eidetic phenomenon is a peculiarly precise form of imagery. In an extensive survey in the Marburg district they report that the "T" type (tetanoid) is more frequently met with where the lime content in the water is low and that the eidetic phenomenon disappears with the administration of calcium and cod liver oil.

<sup>1</sup> S. Maurer and L. S. Tsai. "Vitamin B deficiency and learning ability." *Jour. Comp. Psychol.*, 11: October, 1930, 51-62.

<sup>2</sup> Eva Ruth Balkin and Siegfried Maurer. "Variations of psychological measurements associated with increased Vitamin B complex feeding in young children." (A Preliminary Study.)

<sup>3</sup> E. R. Jaensch. "Zur Analyse der Gesichtswahrnehmungen." *Zsch. f. Psychol., Ergänzungsb.*, 4, 1909. Also E. R. Jaensch. *Grundzüge einer Physiologie und Klinik der psychophysischen Persönlichkeit.* (Berlin, 1926.)

Here we have a clear case of a mental reaction (imagery) conditioned by a specific chemical agent, and since diets deficient in calcium are not unusual, it is not impossible that certain children are reflecting calcium deficiency through hyper-irritability in both academic and non-academic situations.

Somewhat similar to the vitamin deficiencies is the pathology of pellagra. Pellagra is a diet deficiency disease and was formerly thought to be associated with the too extensive use of improperly cured corn. Recent research, however, suggests it may be a vitamin deficiency disease. It is not rare, even though its prevention is well understood, and is encountered not infrequently in such districts as North Italy and the southern part of the United States. One of the effects of advanced pellagra is a real psychosis, but we do not know how the milder and earlier stages reflect themselves in mental operations.

*d. Malnutrition.* Although the discussion of vitamins bears intimately upon the question of malnutrition, it does not cover the entire territory of malnutrition. Malnutrition can be both quantitative and qualitative in character. There are large groups of children in school who are suffering from chronic malnutrition. But careful consistent surveys of the achievement of such children is lacking. Suggestive in this direction are some researches by Seham and Seham.<sup>1</sup> These workers attempted to duplicate in rats clinical conditions met with in medical practice and in public-school children and to measure the effect upon spontaneous activity. Malnutrition, in their studies, seemed to reflect itself in increased activity in the rats for some time afterward, a fact somewhat in harmony with the observation often made that the malnourished child is not necessarily a poor achiever in school.

In their study of forced activity, when the rats were compelled to move by means of rotating cages, remarkable decrease in activity followed. Apparently the animals had been either severely conditioned against activity, or else the wear and tear upon them in the process of forcing was much greater than a similar amount of work done under spontaneous motivation. Such researches may be the beginning of a real experimental attack upon some of the conditioning factors in motivation and the consequent achievement of children in the public schools.

*e. The Glands of Internal Secretion.* No one acquainted with the

<sup>1</sup> M. Seham and G. Seham. "The relation between malnutrition and nervousness." *Amer. Jour. of Diseases of Children*, 37: January, 1929. Also "An experimental study of chronic fatigue." *Ibid.*, 37: May, 1929.

physiology of the various glands of internal secretion can doubt the significance of these agents in affecting behavior. They influence all mechanisms. In fact they seem to be so primary to function in the living animal that life and integrated behavior is impossible without them. Some writers no longer distinguish them sharply from neural tissue, except in the anatomical sense, and refer to the integrating behavior mechanisms as *neuro-glandular mechanisms*. Such usage is both justified and desirable, since neither neural nor glandular tissue has much meaning apart from the other.

The glands of internal secretion are phylogenetically old mechanisms and functionally have changed little, if at all, from the time they made their appearance. This is indicated by the ease with which therapy is possible through the administration of the substance taken from an animal of a different species. Thyroid deficiency in the human being can be corrected just as well by thyroid substance derived from a sheep or a pig as from another human being.

This wide interchangeability, or transferability, suggests that in these structures nature is employing a primary control mechanism. In fact, the issue is forced whether the differentiation of neural tissue in the process of evolution has not taken place somewhat in reference to these primary chemical controls. Certainly none of the vertebrates is capable of functioning without the benefit of these hormones; and seemingly, also, regardless of the neural complexity or differentiation in any form, they are present and even determine many of the conditions of neural operation. These agents can even exert their effect in the absence of neural control, as is demonstrated by tissue therapy, and by transplantation and denervation.

Space does not permit full discussion of the various glands. Their functions differ widely. In certain instances they are even antagonistic; in other conditions agents from different glands facilitate each other, and if one is lost the other takes over some of the functions. Thus, for instance, the *parathyroids* are intimately related to the metabolism of calcium, so essential to neural stability. The *thyroid* influences metabolism and growth to such a pronounced degree that in its absence profound depression occurs. There is a depressed basal metabolism, a lowered blood pressure, a dry scaly skin, a failure in growth, a phlegmatic emotional tone, and a depressed and inferior intelligence. Proper therapy, through thyroid administration, so far as we know, alleviates all these symptoms.

The *pituitary* is one of the master tissues. It manufactures not one,

but many, secretions, having quite distinct functions. Growth, weight, total metabolism, respiration, pulse, and reproduction are but some of the activities influenced by this remarkable gland. It has even the power to determine whether one will be a Tom Thumb or a Goliath.

Of like significance are many of the other glands. The islets of Langerhans tissue in the *pancreas* are responsible for sugar metabolism, disturbances of which can manifest themselves in the dreaded neural depressive condition of coma, or, as in the case of blood sugar depletion, convulsions. Since coma and convulsions are indicative of neural pathology, there can be no doubt of the significance of sugar metabolism for the health of nerve cells and their consequent functional expression. So far as the data permit generalization, we are not warranted in excluding the higher neural cells from this influence of sugar metabolism and must still entertain the hypothesis that disturbances of sugar metabolism may influence mental behavior, even in such realms as intelligence and learning.

The *gonads* are responsible for the secondary sex characteristics and in the case of gonad removal, such as is typified by the capon, the gelding, and the human eunuch, profound personality and body changes result. The capon loses its rôle of 'cock of the walk' and will even brood chickens. No less profound are the changes of temperament in the gelding and the eunuch.

The cortex of the *adrenals* is vital to life, and the medulla of the adrenals is closely related to the state of the emotions. Such are but a few of the baffling physiological activities of these phylogenetically old, but extremely important, tissues.

To wade through the mass of evidence available in this field is a task no reviewer welcomes. Many of the data are conflicting, and the mechanisms are so intricate and delicate that little certainty can at present be indulged. But even so, some of the data are so clear that their bearing cannot be questioned. It is certain that the glands of internal secretion have intimate relationship to neural as well as to other tissues. This denies clearly the hypothesis of neural isolation and dominance, and raises insistent questions concerning the bond theory of learning, the constancy of the I.Q., and current theories about incentives and motives.

No single factor, except possibly the factor of original equipment, touches the territory of learning more intimately than motivation. Motivation is something within the organism, capable of mobilization

for action, in the presence of stimuli or incentives. And that something is clearly influenced through the avenue of the emotions. Yet the emotions, according to Cannon,<sup>1</sup> are influenced through the adrenals. In addition, various other glands, such as the thyroid, the gonads, the parathyroids, and the pituitary, show some capacity to accomplish changes in behavior, a part of the expression of which is changed emotional tone.

#### VI. BEARING UPON THEORIES OF LEARNING

In the presence of such facts it takes a courageous person to systematize learning phenomena and confine them within the small cage of a 'bond' theory. The existence of bonds, in a psychological sense, is not in question, but decidedly there is room for skepticism when the facts of associational psychology are translated into terms of synaptic connections.

Careful scrutiny of the data dealing with the function of the synapse reveals few facts that warrant the big assumption of the *neural track hypothesis* — there is ample evidence in psychological behavior itself that questions it, such as the negative learning that Dunlap has pointed out and retroactive inhibition.

The fairly well established facts about the synapse are these: (1) synapses exist — presumably for some reason; (2) the neural impulse is retarded at the synapse; (3) the synapse is more subject to fatigue and the action of drugs than is the nerve fiber; (4) possibly some kind of secretory process goes on at the synapse; possibly neuro-fibrillae are not interrupted at the synapse; (6) a protoplasmic membrane may separate different nerve cells at their junctions, but the evidence for this is not clear. The neural track theory is based upon this, in a sense, least secure of the data now available on the synapse.

Other physical-mental relationships could be mentioned that bear upon this baffling and little understood topic of the physical basis of mental behavior, but no one at present can satisfactorily systematize the data into a clear and adequate statement of the essential mechanism underlying mental phenomena. Those who have tried it have failed grotesquely; Mathew's<sup>2</sup> reduction of learning to the oxidation rate of linolinic acid is a case in point.

<sup>1</sup> W. B. Cannon. *Bodily Changes in Fear, Hunger, Anger, and Pain*. (New York: Appleton Company, 1915, 1920.)

<sup>2</sup> A. P. Mathews. *Physiological Chemistry*. (Second Edition, New York: William Wood and Company, 1916.)

But the failure of people in this direction is no greater than the failure, already commented upon, of those psychologists who have devoted themselves to the pragmatic pursuit of their own content, ignoring the physical bases of behavior.

## CHAPTER II

### INTELLECTUAL FACTORS

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In this chapter we limit our consideration to what is commonly known as the intellect. The intellect may be thought of in several ways: as the fundamental instrument responsible for understanding relationships; as the ability to abstract, judge, or reason; as the ability to respond well to new situations, to do 'originals'; and as the ability to learn. In many practical situations intellect may be considered to vary with the ability to learn more things or to learn the same things more quickly. We shall treat intellect mainly as the ability to understand directions or to use relations of likeness, part and whole, genus and species, or to use facts together.

#### I. ASPECTS OF INTELLECT

We may think of intellect as possessing altitude, or level; width, or range; and area, or volume. Altitude, or level, of intellect is the height at which the intellect can attain success with a series of intellectual tasks ranked for difficulty. Width, or range, of intellect at any given level of difficulty is measured by the variety of tasks mastered at that level. Area, or volume, is the term used to mean the total number of tasks of some specified sort at which an intellect succeeds. Most intelligence tests determine the altitude of the intellect. As important as this possession of intellect is, one should not overlook the importance of intellect's other possessions. These other possessions indicate to a certain degree what the individual has done with his intellect, how much he has used it, and how many different avenues of interest have been pursued. It is evident that these possessions are influenced considerably by training, motives, and interests.

Psychologists recognize different kinds of intelligence, such as abstract intelligence, social intelligence, and concrete intelligence. With our complicated human nature we rarely find a person who is equally competent in dealing with abstractions, social relationships, and the concrete facts of life. There are some persons who are above average

in all three respects, some who are below average in all three respects, some who are above average in one and below average in the other two, and some of whom the opposite is true; that is to say, human traits are rarely perfectly correlated either positively or negatively. Further, zero correlations between traits are about as rare. However, desirable traits tend to vary positively with one another; *e.g.*, intellect and mechanical ability are positively related. The relation may be slight or average or high. This means simply that intelligence and mechanical ability tend to be associated, though so long as the relation between the two is not perfect, there will be some persons who are above average in intelligence and below average in mechanical ability and vice versa. This is very important from the practical point of view, because there are certain individuals who can be given definite vocational advice. A person whose mechanical ability is average or good and whose intellect is poor may be advised helpfully to go into mechanical work, certainly definitely advised not to go into work that may require abstract intellectual operations. A person who is low in mechanical ability and superior in intellect may be advised helpfully to choose an intellectual, or at least a non-mechanical, vocation. We would not wish to push this line of thought too far. The hypothesis of types of intelligence has been unwisely and unwarrantably applied in assigning pupils to certain lines of work.

## II. DEFECTS OF INTELLECT AND LEARNING DIFFICULTIES

From the standpoint of learning, intellect may vary in three directions to cause learning difficulties. First, there may be a general intellectual deficiency, usually congenital, in intellectual capacity. Second, there may be a special deficiency in some particular expression of the intellect quite apart from the general intellectual level, which may be average or superior. Third, there may be a temporary or transient lack of proper integration of the highest mental processes with consequent inadequate reactions to learning situations. These three intellectual factors will be discussed in order.

### 1. Intellectual Deficiency

The intellectual level that the child possesses determines to a large degree his success in school. Hence the evaluation of the child's general intelligence is one of the most important, if not the most important, task of the teacher in relation to such problems as grade placement, methods of instruction, and scholastic achievement. Intelligence — the ability

to learn, to adjust to one's environment, the capacity to profit by experience or to deal with novel situations — is a basic instrument of control. A serious defect of general intelligence will gravely affect the functional efficiency of the child.

*a. Expressions of Intellectual Deficiency.* Intellectual deficiency is complex. It is not the absence of a unit trait or characteristic; rather it is generally characterized by a congeries of defects and deviations. These may take the form of the diminution, perversion, or absence of various functions or of the overdevelopment of certain traits.

(1) Retardation in Mental and Physical Development. In most cases of intellectual deficiency there will be a history of retarded development from infancy. This retarded development expresses itself in lateness in cutting teeth, in sitting up, in attempting to stand, to walk, and to talk. Later on it may express itself in an inability to feed and dress oneself, to control bowel and bladder movements, and to fit into the family configuration.

(2) Low Intelligence. The mentally deficient child presents a striking defect of intelligence, sagacity, judgment, or common sense, aside from illiteracy and ignorance. It is difficult to determine to a nicety the precise amount of intelligence a child may possess and still prove to be mentally deficient. However, it may be stated that the lowest two percent of the total population is so lacking in general intelligence as to be considered mentally deficient. Specific indications of low intelligence are lack of acuteness in perceptions; lack of spontaneous attention; faulty retention and recall; feeble imagination; little or no foresight, prudence, planning, or inventiveness; lack of self-criticism; inability to see relationships or deduce correlates and inability to perceive and progress toward a goal.

The mentally deficient child has a defective sensory capacity that makes it difficult for him to discriminate between sensory impressions of the same order (visual, auditory), but of slightly differing intensity. Even the organic sensations of pain, cold, hunger, and discomfort may be obtuse. In these children attention is defective both in amount and in duration. Such children do not attend very intently, and when their attention is gained, it is easily distracted by trifling stimuli in the environment. They have great difficulty in connecting a word with an object or in recognizing a printed character or a numeral as a symbol of a concrete object. They experience difficulty in naming colors, although they may be able to match them. In general, mentally defective children are imitators rather than originators. They may repro-

duce faithfully, but they create only on a low level. All mentally defective children lack in logical, and most of them in esthetic, sense. Their knowledge is largely 'parrot knowledge,' and they possess very little real insight into relationships. As they progress through the grades, they fall farther and farther behind in such subjects as arithmetic, spelling, reading, and writing.

(3) Social and Industrial Dependency. Economically and socially the condition of the mentally deficient is one of social insufficiency and industrial and economic dependency. These conditions will be noticed in the child's school activities, particularly in the extra-curricular and literary branches.

(4) Emotional and Instinctive Deficiency. In general, the mentally deficient have poor control of instinctive and emotional responses. Moreover, the expressions of these are frequently exaggerated or perverse. The high quality of mind needed to enable a child to check his instinctive tendencies, which represents a higher development than that needed merely to coördinate acts for the requirements of the immediate moment, is seriously lacking. The mentally defective child is unable to judge the consequences to himself and to others of his unrestrained instinctive tendencies. He is a child of the moment. He presents either a delayed development, or complete lack of development, of the higher inhibitory functions of the mind. As a consequence, his moral and social sense is considerably retarded or entirely lacking.

(5) Motor Deficiency. The typical feeble-minded child possesses poorer motor coöordination than the normal child. Both the quantity and quality of his movements may be affected. In a considerable number of mental defectives there is a retardation in sitting up, standing, and walking, and speech may be strikingly delayed. The appearance of such children is usually characteristic; the face presents a dull, heavy, and vacuous expression, and there are many indications of a want of muscular tonicity. In certain muscles of the head and face this lack of muscle tone often manifests itself by a dropping of the lower jaw and a persistently open mouth. Continuous slavering is very common in such cases. In walking such children present a typical slothful clumsiness. The hands and fingers are flabby. There is another type in which there is an excessive amount of movement. The condition is one of almost ceaseless activity, which expresses itself in spasmodic frowning and knitting of the eyebrows, grinning, smiling, grimacing, nodding and shaking the head, shrugging the shoulders, opening and

closing the hands, swaying the body, biting the nails, and sucking the thumb.

The quality of the movements is so affected as to produce a general incoördination, particularly of purposeful, volitional acts. The mentally deficient child has difficulty in lacing and tieing his shoes, buttoning his clothes, and handling the fork or spoon at the table. As might be suspected, he has particular difficulty with speech. The importance of the relationship between mental deficiency and speech defects is discussed in a later section.

*b. Forms of Mental Deficiency.* Although there are many causes of mental deficiency, the one factor most closely related to the condition is an improper development of the central nervous system. On the basis of what may be back of such development of the nervous system, mental deficiency is usually considered under two different forms.

(1) Primary. Mentally deficient individuals possessing this form of amentia are the products of a defective germplasm in consequence of which the development of the central nervous system is irregular and imperfect. As a rule these defectives come from a stock, a large proportion of whose members are characterized by feeble-mindedness and its attending inadequacies.

(2) Secondary. Mentally deficient individuals of the secondary form are the products of disease or other adverse environmental conditions that operate to interfere with or arrest the development of the central nervous system. Such factors as intra-uterine disturbances, birth injuries, injuries subsequent to birth, and mental and physical diseases are to be listed among the causes of this form of mental deficiency.

(3) Delayed Primary. There are a few cases that seem to be intermediate between the two main groups just listed. In these cases bad heredity is present, but the brothers and sisters of a given case are seemingly healthy, and the child himself has seemed normal until the advent of some illness in the early months or years of life. Here an exciting factor operated in conjunction with a much more important predisposing hereditary one.

*c. Degrees of Intellectual Deficiency.* The broader term 'mental deficiency,' as such, need not restrict the deficiency to any phase of the mind to the exclusion of other phases. However, we are primarily concerned here with a deficiency in intellect, which is best stated in terms of an intelligence-test score. The tendency from this point of view is toward conceiving mental deficiency as denoted by an IQ rating of

70 or less and falling within the lowest two percent of the ratings of the general population. Definite feeble-mindedness may not include more than one-half of one percent of the total population. A provisional upper limit for feeble-minded adults is a mental age of eight years, which would give an IQ of not more than 50. From an educational standpoint, one may look upon IQ's of 50-60 as indicating institutional supervision and from 60-70 as indicating special classes. All IQ's below 50 indicate the advisability of institutionalization.

On the basis of IQ's, mentally deficient children are again grouped into the three following classes: (a) 0-24, idiots; (b) 25-49, imbeciles; (c) 50-69, morons.

*d. The Improvement of Intellect.* The important question arises of the possibility of increasing intellect. This problem may be approached from the standpoint of heredity and environment. Although there still remains a lively controversy in regard to nature-nurture contributions to intellect, it may be stated that heredity plays an important rôle in the determination of the amount of intellect any given individual possesses. If this is true, or even only partially true, the problem of improving the intellect becomes an eugenic one. However, a sufficiently large contribution to intellect is made by the environment to warrant consideration of such factors as physical health, home and school conditions, and continued opportunity for achievement at the maximal level of the individual's ability. Certain facts lead us to believe that the establishment of a more normal balance in the functioning of the endocrine glands and an increase in the level of general health operate advantageously on intellectual growth in certain children. Although the improvement in an individual's general health may not actually raise sheer intellectual power, it will permit the individual greater freedom in using what intellectual ability he does possess. Studies in which children in homes of different social levels have been compared have indicated that environmental factors do play an important rôle in the development of intellect. The irregularity of the mental growth curves of children bear out these contentions. Such irregularity is most easily explained as due to variations in health and in social factors contributing to intellectual growth, operating in conjunction with the capacity given by heredity. Even though, then, intelligence *per se* may not be increased, certainly the uses made of it can be improved. In a certain sense, to do this is about as important as to increase native intellectual capacity.

## 2. Special Disabilities

A child may fail to learn to read or spell or achieve satisfactorily in music and yet be of adequate intelligence. In some children there is a close relation between ability in one direction and ability in another direction. Also in some children there is a close association between ability in some given direction and general intelligence. However, in other children there is striking disparity between ability in one subject and that in another or between achievement in some subject and general intelligence. Such discrepancies may appear between rather closely related abilities, such as reading and intelligence. We find, for instance, such combinations as a child who cannot read although he can comprehend material read to him and another child who presents just the reverse condition.

The child who does not achieve so well as would be expected in a certain direction may be regarded as having a special defect or disability. Such a defect, if persistent, usually prevents the child from making progress at school and may ultimately interfere with his adjustments and successes outside the school.

*a. Expressions of Special Disabilities.* A teacher should suspect the presence of a special disability in a child who persistently is deficient in a given direction when he is average or superior in other directions and in general intelligence. Generally coupled with the child's deficiency in a given subject is a lack of interest in that subject. The teacher should be careful to determine which is cause and which effect. The clearest expression of a special disability is consistently low scores on a series of tests in a given subject conjoined with average or superior scores on tests in other subjects. Such scores can be arranged to give an 'educational profile.' For example, in a case of reading disability, a child might obtain scores placing him in the ninth grade in arithmetic, in the eighth grade in spelling, and in the third grade in reading. Here we would have evidence of a striking reading disability. An unevenness of achievement for another child might indicate just as striking a disability in arithmetic. For example, a student's percentile ratings for various subjects were as follows: reading 54; English 68; French 35; arithmetic 8. Here we have evidence of a striking disability in arithmetic.

*b. Forms of Special Disabilities.* Special disabilities present a great variety of detailed forms. However, we may list them under the following main heads: (a) perceptual disabilities, (b) deficiencies in

visual and auditory memory span, (c) alexia, or word-blindness, (d) aphasia, (e) agraphia, (f) amusia. A few words about these several forms:

(1) Perceptual Disabilities. Quickness of perception is indicated in part by the number of diverse stimuli that can be perceived within a limited period of time under conditions of attention. It is obvious that, other things being equal, the more objects a child can apprehend in a moment of time, the more efficient he is likely to be. Although the richness of mental content bears some relation to quickness as well as to the range and accuracy of perception, differences in special native equipment seem to account mainly for the large differences found among children in regard to perceptual ability. This ability is affected by such factors as age, the physical and mental condition of the child, and diseases, e.g., epilepsy. It is probable that this function can be improved by specially constructed daily exercises. Differences that certainly exist in children in perceptual ability should be evaluated in relation to certain methods of teaching, such as the 'flash' method of teaching reading.

(2) Deficiencies in Visual and Auditory Memory Span. Memory span is related to general intelligence, but not sufficiently closely to neglect the span. Further, auditory memory span appears to be related to certain special disabilities, such as speech defects. 'Memory span' denotes the maximal number of presentations (visual, auditory) given by the examiner that can be returned correctly by the child. For example, the average three-year-old child has an auditory memory span of three digits, and the average ten-year-old child has an auditory memory span of six digits. This function is important in classroom teaching. Some children are unable to remember as many discrete words or numerals written or spoken as other children. The teacher in realizing these differences can adjust her teaching procedure to approximate more closely individual needs.

(3) Alexia, or Word-Blindness. Alexia manifests itself mainly in an inability to recognize the meaning of written or printed characters. In some cases it is the result of a lesion in the brain; in others it appears to be the result of a faulty development of certain parts of the brain. In the former cases the defect is considered acquired; in the latter, congenital. The word-blind child can comprehend oral material and through the auditory channels acquires speech and other mental functions. He may possess average or even superior general intelligence, but because reading is so important for both the development

and expression of the intellect, usually he appears to be retarded mentally. Frequently writing suffers along with reading; there appear misspellings, reversals of both letters and words, neographisms (new writing symbols), and other anomalies.

(4) Aphasia. Aphasia is a defect in, or a loss of, the power of expression by speech, writing, or signs. It is usually due to injury or disease of the brain, but may be congenital. Its main manifestations are difficulty in pronouncing words, difficulty in finding the word or expression needed, errors in the grammatical structure of a phrase or sentence, and inability to comprehend the significance of words and phrases as a unit. If the defect is severe, all language functions (speech, reading, writing) may be affected. In young children an aphasic condition may express itself in markedly retarded speech development. Speech is slowly and laboriously established and rarely, if ever, reaches a stage of normal fluency.

(5) Agraphia. Agraphia is the inability to express thoughts in writing. It is generally due to a brain lesion, but, like alexia and aphasia, may be congenital. In a severe form, there is loss of the power to form even single letters. More often there appear such deficiencies as lack of ability to write from dictation (without loss of ability to copy); inability to arrange letters and words written, to express an idea; the production of senseless combinations of letters; lack of ability to copy without a loss of ability to write from dictation; or inability to write words without loss of ability to write letters.

(6) Amusia. Amusia refers to the loss of the ability to apprehend or to produce melodies or musical sounds. It appears generally as inability to sing in tune or to distinguish one tune from another. A person with amusia may be able to play a piano 'by note,' but will be unable to play instruments that demand an ear for music.

### 3. Transient Interferences with the Intellectual Processes

There are a number of factors relatively independent of general or special intellectual deficiency that may cause learning difficulties. Whether these are determined by inherent mental organization or by pedagogical influences is not known. However, there is reason to believe that they are advertisements of the way the mind itself operates in relation to stimuli. What has been learned or the way the mind has been shaped may interfere with, as well as assist, the learning of new materials. These interference processes may operate in an infinite variety of ways. We cite three more obvious forms.

a. *Conflicts in Symbolic Formulations.* To put it very simply, a word may come to symbolize an object or an act provided that it is associated in time or space or both sufficiently often with that object or act. But this may not happen properly if the mind is so organized that the order of the letters in a word are reversed so that 'dog' may be read as 'god.' Further, it may not happen if the child in learning that 'calculus' is a branch of mathematics is confronted with the fact that 'calculus' may also be a form of deposit on the teeth. In the former case we may have a conflict in conceptual formations because of a confusion of imagery; in the latter case there may be a conflict because the perseveration of one word-object relationship interferes with establishment of another word-object relationship where the same word is common to both relationships.

b. *Perseveration.* Not only may a mental process of the present moment carry over into the inauguration of another mental process, thereby causing an interference with the latter, but a concept or procedure learned in the past may also interfere with the establishment or carrying out of a subsequent concept or procedure. Especially is this true if the two mental processes have common elements. To illustrate the former, a child may have difficulty in learning to spell 'too' immediately after attempting to learn to spell 'two.' To illustrate the latter, a child may have performed correctly, before he studied multiplication, the example  $1/4 + 2/4 = 3/4$ . After he has studied multiplication, however, he may report the answer to be  $3/8$ . Here he remembered to add, but he added both the numerators and the denominators.

Perseveration may operate in connection with another mental process, 'mental set.' Mental set operates particularly strongly in some children in those situations which demand a rapid shift of application of a child's energies from one thing to another. The situation is embodied in the common phrase "I can't do that now, I have something else on my mind."

c. *Attention.* In the absence of attention, stimuli leave blurred impressions or even none at all. Attention is an essential prerequisite of all learning. Disorders and lapses of attention cause educational maladjustment, and chronic derangements of it constitute grave handicaps. Attention may be roughly defined as the focusing of consciousness upon one thing to the relative exclusion of all other things. The teacher should realize that attention depends upon many subjective and objective factors. Among the former are interest, motivation, attitude,

habit, and effort; among the latter are the character of the stimuli and elimination of distracting influences. Further, he should note certain aspects of the child's attention, such as the ease with which it can be aroused, its depth, range, and persistence, and the child's capacity to return his attention spontaneously should it have been disrupted or distracted.



## CHAPTER III

### PEDAGOGICAL FACTORS ASSOCIATED WITH LEARNING DIFFICULTY

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The factors associated with learning difficulty are to be found not only in the physical and mental equipment of the learner but also in the instructional situation itself.

#### I. INADEQUACY AND INEFFICIENCY OF INSTRUCTIONAL MATERIALS

1. The instructional materials may not be efficiently constructed. This fact has been repeatedly revealed in the field of reading and arithmetic. For example, in the *Twenty-Ninth Yearbook* of this Society, Knight presented data showing how little attention had been given in the preparation of many modern arithmetic textbooks to the analysis of the learning difficulty the subject presents to pupils. In some of the books that were analyzed essential basic skills did not even appear; for many of the easy skills extensive practice was provided, while for many of the difficult ones little, if any, practice was provided. In most of the books practice was very inefficiently distributed, apparently with no definite specifications in mind to guide in the organization of the material. Similar inadequacies have been revealed in many of the supplementary drill materials in arithmetic published in workbooks.

2. With a few notable exceptions the published practice exercises in reading, arithmetic, writing, and other tool subjects have been organized in such a way that little, if any, provision is made for variations in rates of pupil progress. All pupils are given the same assignment of work, in spite of the fact that the need of providing for individual differences has been amply established. The time should not be far distant when every classroom will be provided with instructional materials in the skill phases of each subject that will make possible adaptation of instruction to individual differences.

3. The use of achievement tests to evaluate instruction has had a marked influence on the quality of teaching. Most of the standardized survey tests used at the present time deal with relatively narrow out-

comes of instruction, such as specific factual knowledge and skills. Because of the emphasis often placed on the results of these tests by administrative officers, teachers devote the major part of their time to instruction dealing with only a small section of the total area of educational outcomes. The remedy for this condition is the clear recognition of the whole range of desired objectives of instruction and the use of suitable methods to measure the extent to which all of them are being achieved.

4. Where the requirements of rigid, narrowly conceived courses of study dominate instruction in the classroom, the teacher cannot adapt the work to the interests, abilities, and needs of the pupils in the class. Under such conditions, instruction often becomes highly formalized. A survey of the newer courses of study shows that increasingly it is being recognized that the intelligent, well-trained teacher, guided by a sound educational philosophy, is the best judge of the types of instruction required to insure the well-rounded development of the pupils in his care.

5. Lack of instructional material suitable for purposes of enrichment may result in much narrower pupil understandings and appreciations than is desirable. Lack of supplementary materials also results in a narrow, intensive treatment of a subject instead of the extensive study that, as investigations have demonstrated, yields much richer returns. An ample supply of well-selected instructional materials also makes it more possible to adapt instruction to individual differences, since provision may be made for materials of a wider range of difficulty suitable for assignment to pupils of varied levels of ability.

6. The instructional materials may be too difficult for the pupils. Investigations have shown that in some cases the reading material used in classes was at least two grades too difficult for some of the pupils. Problem material in arithmetic textbooks, for example, has in some cases been found to be so difficult that at the end of the school year pupils were able to solve less than 40 percent of a random selection of problems contained in them. This factor is especially important in dealing with problem cases, since such pupils should often work with materials at least one or two grades easier than those that are of normal difficulty for the grade. Recent research on the grade placement of certain processes in arithmetic shows that they are now placed much earlier in the curriculum than they should be if they are to be mastered with reasonable ease. Rapid progress is being made in the improvement of instructional materials, simplifying the content, grading it

more closely to the ability of pupils, and selecting materials of demonstrated appeal to children.

7. Teachers and writers of instructional materials in many cases apparently assume a greater amount of transfer than in fact exists. Studies by Carroll,<sup>1</sup> Overman,<sup>2</sup> and others show that transfer exists in useful amounts in the case of children above the average in ability, since they generalize to a considerable extent, but that pupils of less than average ability lack any considerable power to generalize. Direct training in methods of transfer is very helpful for all pupils and is essential for slow pupils. It appears to be necessary in general to proceed step by step through the elements of a skill on the assumption that there is not a large amount of transfer from one skill or element of a skill to another, especially in the case of pupils of less than average ability. For example, it is obvious that all of the needed uses of the comma should be taught, although bright children may learn many of the uses incidentally. This conclusion relative to the ability of slow children to generalize should lead to the more careful scrutiny of the pedagogy involved in teaching any skill, for the purpose of reducing it, in order to facilitate learning, to as simple, well-graduated elements as possible. It seems evident that teaching procedures in instruction of pupils of superior ability should seek to capitalize the ability to generalize, whereas with pupils of inferior ability instruction must provide for direct training in methods of transfer. For slow groups instruction must proceed through carefully graduated steps requiring a relatively small amount of transfer and generalization.

8. Often no adequate provision is made in instructional materials for maintaining the skills that have been developed. Because of the rapid deterioration of skills in language, arithmetic, and spelling occasioned by disuse, it is necessary that a systematic maintenance program be provided. This program should consist of learning activities in which these skills function naturally, as well as carefully organized, formal practice exercises that provide systematic reviews.

9. The materials in textbooks are in many cases selected and organized in such a way that they do not appeal to the interests of children. The experimental evidence on the value of motivation in learning

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<sup>1</sup> H. Carroll. *Generalization of Bright and Dull Children*. (Teachers College Introduction to Education, No. 439.)

<sup>2</sup> J. Overman. "An experimental study of the effect of methods of teaching on transfer of training in arithmetic." *Elementary School Journal*, 31: November, 1930, 183-190.

clearly justifies the contention that unattractive, uninteresting instructional materials do not contribute effectively to the development of desirable interests and work habits of pupils. Fortunately much is being done to improve the construction of schoolbooks through studies of interests of children and of elements in books such as illustrations, cover designs, color, and the like that appeal to children. Typographical studies leading to information as to the size of type and other details of format that favor reading by children at various age and grade levels have also contributed to this improvement. In some instances, however, this aspect of improvement in the materials of instruction has been retarded through the insistence of school officials upon textbook specifications known by experts to be disadvantageous.

## II. FAULTY OR UNSKILLFUL INSTRUCTIONAL PRACTICES AND PROCEDURES

1. Some teaching methods contribute directly to the development of learning procedures that lead to subsequent difficulties. For example, extreme stress on phonetic elements in the early stages of primary reading may result in inability of the pupil to blend sounds into words. Undue stress on oral reading may result in lack of comprehension of what is read, since ability to say words does not insure comprehension. Interference due to confusion of skills results in such cases as where the child first learns finding part of a number ( $\frac{1}{3}$  of 12) as a division example and later on learns to solve the example as one in multiplication ( $\frac{1}{3} \times 12$ ). Similarly, the teaching of rules for spelling often causes confusion owing to the many exceptions to some of the rules. The lack of uniform practices in teaching arithmetic processes often results in confusion. Pupils who have learned one method of work, for example, in subtraction of whole numbers, transfer to a school where a different method is taught. Regardless of the fact that the pupil may be thoroughly efficient in the method he employs, teachers sometimes insist that he learn the standard method taught in their schools. The resulting confusion on the part of the pupils can be readily understood. Undue stress on speed often leads to inaccurate responses by pupils who strive for quick, even if not correct, responses. Speed is also often stressed in drill exercises before the pupils have grasped the procedure involved, with consequent inaccuracy of work. Conversely, undue emphasis on accuracy may operate greatly to reduce rate of work. These and many similar faulty teaching practices often lead to serious learning difficulties.

2. Teachers often fail to recognize the relative specificity of many of the elements into which such subjects as reading and arithmetic have been analyzed. Surveys of present practices in the teaching of reading reveal the fact that most of the emphasis is on two major objectives; namely, the development of comprehension of the printed page and speed of reading.<sup>1</sup> Very little is being done, according to these surveys, to develop other important reading skills, such as ability to use reference books, to outline what is read, to remember what is read, or to evaluate what is read, in spite of the fact that educational theory recognizes the importance of these other skills, and in spite of the fact that their development does not result automatically from the practice on the first two. They are specific skills that must be developed through practice. The teacher who does not see to it that this practice is provided overlooks the specificity of these important skills in reading, essential to the development of effective study habits. Similar shortcomings are common in instruction in arithmetic, language, and other subjects.

3. Failure to aid the pupil to note in a definite way the progress he is making in his studies may lead to lack of interest and therefore to relatively little effort on his part. Excellent standardized progress tests in several subjects are available. They afford the teacher a valuable basis for evaluating the pupil's performance and locating potential sources of difficulty. Their value as incentives for pupils has been experimentally established. To some extent teachers' marks have served the purpose of showing pupils the progress they are making; however, their unreliability and invalidity when based merely on the opinion of the teacher, unsupported by information secured by more standardized methods, has been clearly demonstrated. Thorndike<sup>2</sup> and others have shown that mere practice or repetition without awareness of the effectiveness of the work results in little, if any, improvement. Reliable standardized methods of revealing to pupils from time to time the progress they are making in achieving desired outcomes are essential tools of instruction.

4. Lack of valid standards for the achievement to be expected of pupils sometimes results in making excessive and impossible demands on them. The opposite is true when the standards are too low, for example in the case of superior groups or individuals. In the primary

<sup>1</sup> L. J. Brueckner and P. Cutright. "Techniques for Evaluating a Program in Work-Type Reading." *Minneapolis Educational Bulletin*, No. 12.

<sup>2</sup> E. L. Thorndike. *Human Learning*. (New York: Century, 1931.)

grades arithmetic and reading have long been the subjects on which there have been more failures than can be justified. Variations in the standards from school to school and from teacher to teacher have been revealed. Test results have shown that pupils who were rated as failures in one school were equal in ability to at least the average pupils in neighboring schools and would not have been rated as failures if they had attended there. Yet in their own school they were among the lowest in the class and hence were failed.

5 The marking system and its misapplications often lead to most undesirable consequences. In one college, students in a class of 140 were ranked in the order of their ability, and their names were posted on a public bulletin board. The reader can easily imagine the results of this policy. In another school the so-called 'normal curve' is applied rigidly to all classes in determining the number of grades of each of five levels to be assigned, regardless of the fact that in some classes all students may be doing superior work, while in others all of them may be doing inferior work. The unfairness of such a practice is perfectly evident. In one school in which pupils are classified into ability groups the marking system used led to the lumping of good marks in the classes of superior ability and the piling up of low marks in the classes of low ability, whereas in another school in the same city pupils in all groups were compared with other pupils of their level of ability group. In some systems pupils are marked as individuals, in terms of the all-round growth made by the individual, so as to reveal to him his strengths and weaknesses and to stimulate him to greater effort. In other systems the schools have entirely eliminated formal marking systems and are promoting pupils on an age basis. Their plan contemplates the use of methods of developing in the pupil the ability to appraise the results of his activities in a functional way and the elimination of extrinsic standards and values. Here we find the germ of what may in the long run be a valid basis of evaluation of growth; namely, the plan of making it possible for the learner to appraise the extent to which he is achieving ends that are both socially and personally desirable and to locate and then remove factors that interfere with optimal growth.

### III. FAILURE OF INSTRUCTION TO PROVIDE FOR INDIVIDUAL DIFFERENCES

1. Failure of the school to recognize the fact of differences in the rates at which pupils learn is a major contributing cause of the failure

of many to make satisfactory progress.<sup>1</sup> In classes in which differences in the rates of learning are ignored, the class is treated as a unit, or by what Burk once called "the lock-step system." All pupils, regardless of their ability, do practically the same work. The group as a whole progresses from unit to unit in spite of the fact that it may be quite evident that some of the pupils have not yet mastered the basic elements or skills in earlier phases of the subject required for successful work on the new units. The gradual accumulation of this deficiency ultimately results in complete failure of the pupil to grasp the subject. The pupil is then required to repeat the work of the grade. In recent years many experiments have been made to devise methods that would remedy this condition through more careful classification of pupils, the development of various methods of individualizing instruction, and the organization of group work in classes so that more adequate attention can be given to the needs of individuals. However, in many schools very little effort has been made to incorporate the results of this research in teaching procedures. For example, recent surveys of instructional practices in arithmetic in schools in all parts of the country show that in most classes the methods of mass instruction still prevail. All pupils in the class have the same assignment of examples and problems to work. In the great majority of classes little systematic provision is made for individual differences. Educational research has clearly demonstrated the success with which instruction can be adapted to differences in rates of progress, but the lag between educational science and classroom practices is evidently marked.

2. Where mass instruction prevails, especially if classes are large, the teacher does little to determine reasons for the failure of individual pupils to progress at a satisfactory rate. Each pupil responds to the class instruction by the teacher in ways that are probably unique for each individual, owing to variations in ability, background, and insights. The result is that many pupils adopt original, but highly inefficient, methods of work. The teacher must not take it for granted that, as a result of teaching procedures used in mass instruction, the pupil will develop either an understanding of the subject or the topic, or efficient methods of study and work. Pupils whose test scores show that unsatisfactory progress is being made must be selected for individual study to determine their deficiencies and the basis on which remedial work can be undertaken.

<sup>1</sup> See *The Twenty-Fourth Yearbook of this Society, Part II, "Adapting the Schools to Individual Differences."*

3. Owing to the very large turnover in our school population, many instructional complications arise. As pupils shift from one city to another, they find that the subject matter for the grade is not the same as it was in the city from which they came. The result is that, unless the pupil can begin his work at the point where it was interrupted or some other special adjustment is made, there are large gaps in the basic skills essential to successful work in the grades. Furthermore, owing to excessive absence because of moving from town to town, the pupils' school work is badly broken up. In subjects like arithmetic, in which continuity of work is vital, serious deficiencies may result. Unless adequate consideration is given to such conditions by adapting instruction to the needs of pupils, serious problems will arise in many cases. Here, again, is evident the need of making adequate provision for individual differences.

4. Where instruction fails to make provision for individual differences, the common administrative practice is to require pupils who do unsatisfactory work to repeat the grade. This practice of failing pupils is followed because it is believed that repeating the grade will result in growth and eliminate inadequacies in academic abilities. While these results are to some extent achieved, recent research suggests that the amount of growth that takes place in pupil ability is greater when the pupil is not required to repeat the work of a grade, but is promoted to the next grade. In Long Beach<sup>1</sup> the growth of two groups of potential failures during a year was compared on the basis of a comprehensive series of achievement tests. One group repeated the work of the grade while a similar group was promoted on trial to the next higher grade. It was found that both groups made progress, but that the trial promotion group made a greater growth during the year than the group that repeated the grade. The practice of failing pupils is the direct result of ineffective teaching procedures that do not provide for individual differences. Systematic methods of diagnosing the nature of factors contributing to learning difficulties are not used and the necessary corrective measures are not undertaken. Requiring the pupil to repeat the work of a grade means retardation, and retardation is recognized to be a contributing factor to maladjustments of various kinds, mental, emotional, social, and moral. Haggerty found a much larger amount of undesirable behavior among overage and retarded pupils than among normal or underage children. Competent psycholo-

<sup>1</sup> V. Klene and E. P. Swanson. "Trial promotion versus failure." *Educational Research Bulletin* (Los Angeles), VIII: January, 1929, 6-11.

gists maintain that the feeling of inferiority resulting from failure and the all-too-commonly associated ridicule of members of the child's social group causes the development of many undesirable defense mechanisms, anti-social attitudes, and unwholesome traits of personality. It is apparent, therefore, that from many points of view the present practice of requiring failing pupils to repeat the work of a grade is an administrative device of very doubtful value, since it fails to insure the optimal development of the pupil.

5. Unless the teacher is conscious of individual differences in interests, aptitudes, and appreciations, ordinary regimented mass instruction may destroy special talents of individuals. One of the major tasks of our schools is to discern, select, and stimulate those creative minds which constitute a small, but highly important, fraction of the school population.

#### IV. INEFFECTIVE GUIDANCE BY TEACHERS DURING LEARNING ACTIVITIES

1. There are many different kinds of outcomes of learning activities. These range from specific skills or bodies of information learned to appreciations, attitudes, and purposes. In the modern school statements formulated as guides of instruction have recognized many more of these objectives than did the traditional school. It is recognized that many important outcomes of instruction may be overlooked unless attention is definitely called to them. Teachers often emphasize the formal, more definite aspects of a subject — such as the specific facts and skills to be learned — to the neglect of valuable outcomes — such as attitudes toward the subject and ability to apply what is learned in the activities of life. This failure to consider attitudes and similar less tangible outcomes as important objectives results in leaving them to the wholly incidental, unplanned influence of instruction. It is also clear that attitudes of all kinds are affected by many uncontrolled, often unwholesome, influences in life outside the school that may lead to most undesirable types of learning. The awareness of this condition has caused the school to make definite efforts to undertake more effective direction of given learning experiences that will contribute constructively to the development of certain worthwhile attitudes, appreciations, purposes, and insights that are not given adequate consideration when the objectives of instruction are narrowly conceived. It must be admitted that at present there is little experimental evidence as to what the bases of these 'imponderables' are or how they may be de-

veloped — one reason, doubtless, why they are neglected in practice. That they are a residue of learning experience is clear. That the quality of those outcomes may be raised by determining factors that condition their development may be taken for granted. The knowledge of what these factors are will enable the school more intelligently to undertake the selection of educative experiences whose value as a means of achieving these important outcomes can be experimentally established.

2. A guiding philosophy of education that leads to the suppression of the individuality of the learner and the standardization of groups has serious limitations. When the teacher completely dominates the situation, the desirable social qualities of self-direction, self-appraisal, and self-control cannot be properly developed, and children do not learn to share the responsibilities of coöperative group activities essential to life in a democracy. Instead of being given guidance in practicing the wise selection of worthy goals, they are assigned arbitrarily chosen goals, and indoctrination of ideas selected by the dominating group is practiced. Because of the attempt to force all into a common mold, individuals having special aptitudes are overlooked and their potentialities are undeveloped, to the obvious loss of society. What is true for pupils when the teacher completely dominates the situation, is equally true for the teacher when the teacher is dominated by rigid regulations and requirements of various kinds set up by state and local administrative authorities.

3. At the opposite extreme, the philosophy of education that stresses freedom of the learner and his growth without regard to the direction in which this growth is pointed (other than cues growing out of the interests of the learner) leads to teaching practices which reduce teacher direction and the guidance of learning to a minimum. Fear of indoctrination of the learner and the feeling that too little is known concerning the learning process, in the opinion of many, justify this point of view. As a consequence of this belief, there is in some schools little direct supervision of learning activities and practically no planned attempt to teach pupils effective methods of work. Fear of 'crushing the pupil's individuality' has caused some teachers to hesitate even to suggest procedures that they may regard as of greater merit than those being used by the pupils. The result is that under such conditions many pupils acquire in haphazard, purely fortuitous ways, not only socially undesirable attitudes and ways of thinking, but also methods of work and study many of which are almost certain to be wasteful and

inefficient. Such a conception of the place of the teacher in the learning process cannot be defended when one considers the clean-cut evidence based on experiments by Gates,<sup>1</sup> Woodrow,<sup>2</sup> and others justifying carefully planned, directed instruction that seeks to guide learning into worthwhile channels and to teach efficient study habits and methods of learning. "It is the business of the educator to study the tendencies of the young so as to be more consciously aware than the children themselves of what the latter need and want; any other course transfers the responsibility of the teacher to those taught."

4. Judging from the frequent failure of teachers to make definite efforts to teach pupils efficient study habits, it appears that many teachers either lack the necessary professional knowledge and skill or else believe that pupils somehow or other can *invent* effective methods of work. That such a belief is unwarranted has repeatedly been demonstrated in investigations of the study habits of students. It may be granted that pupils of superior ability may devise methods of learning that seem to yield satisfactory results, but certainly not all of them hit on the methods that are most effective. Pupils of good ability who do not make satisfactory progress may be seriously handicapped by faulty methods of work, which, without the help of the teacher, they have no way of knowing about. It is too much to expect pupils of inferior ability to discover the most effective study habits. Certainly a more rational and defensible procedure would be for the teacher to present to all pupils methods of work that have been experimentally demonstrated to be effective and to help the pupils, regardless of their mental level, to select the methods that yield the best results for them. In this way all pupils can participate in what amounts to the discovery of efficient methods of work.

5. In some cases teachers have attempted to teach an entire class a single, uniform pattern of procedure to be used, for example, in studying a list of words to be spelled or in memorizing a selection. It was expected that this particular method would be mastered by all members of the class. The assumption has been that such a pattern is readily adopted by all the pupils. Experiments have clearly demonstrated that, in spite of such a teaching procedure, many, if not most,

<sup>1</sup> A. I. Gates, M. R. Batchelder, and J. A. Betsner. "A modern systematic versus an opportunistic method of teaching." *Teachers College Record*, 27: 678-701.

<sup>2</sup> H. Woodrow. "The effect of type training upon transfer." *Journal of Educational Psychology*, 18: 159-172.

pupils fail to grasp the significance of important details of the pattern and to modify them in ways to suit their individual needs. Pupils of superior learning ability appear to use fairly clean-cut procedures involving some aspects of the pattern, but their methods appear to vary widely from pupil to pupil. Pupils of inferior ability often do not have any systematic method of learning at all, in spite of the fact that the teacher may have attempted to teach them a definite procedure. The difficulty in such cases seems to be that the teacher has not made clear to the learners the value of the plan being taught or the significance of the constituent elements of which it is composed, so that for the pupil the routine is meaningless. The desirability of teaching all pupils a particular pattern of study habits may be questioned. Just as pupils vary in their intelligence, rates of learning, interests, and backgrounds of experience, their methods of study will and probably should differ. However, study habits are not the result of magic; they are the residue of learning experiences. To insure economical, efficient methods of learning, these educational experiences should not be random and unplanned, but should be selected because of their demonstrated value in achieving desired ends. We are becoming aware of the fact that we need to know much more about the characteristics of good methods of learning than we now know, and more about how to assist the pupil rationally to acquire efficient methods of work. It is evident that methods of learning may be unique and vary from individual to individual; much more individual guidance and suggestion must be given than we have believed necessary.

#### V. UNDESIRABLE PERSONAL AND SOCIAL RELATIONSHIPS BETWEEN TEACHER AND PUPILS

1. The teaching procedures used in classrooms in which compulsion and domination rather than a more natural atmosphere prevail place a premium on those personality traits that are associated with submission, docility, retirement, and inhibited responses, rather than with freedom, initiative, and self-expression. The recent work by Wickman,<sup>1</sup> Haggerty, and others suggests that many teachers seem to rate high in value such types of behavior as docility, submissiveness, and other qualities that contribute to the conduct teachers desire, but that psychiatrists rate as relatively undesirable social reactions. Psychiatrists stress the need of self-expression through activities in which

<sup>1</sup> E. K. Wickman. *Childrens' Behavior and Teachers' Attitudes*. (New York: The Commonwealth Fund, 1929.)

pupil initiative is expressed and in which there may be more bustle and noise than the usual teacher will tolerate in the classroom. It is not to be wondered at that in many classrooms where the learning situation is tense and unnatural, many unwholesome, undesirable traits of personality are developed.

2. The personal relationships between the teacher and pupils are vital factors in the development of wholesome attitudes, appreciations, and loyalties. The teacher who is suspicious and doubts the honesty of her pupils may induce in them dishonesty. Wickman reports the case of a teacher who indicated on a rating blank that every pupil in her class of forty individuals cheated "sometimes" or "often" in his school work. The teacher may have had unusually clear discrimination leading to correct appraisal. In that case one wonders to what extent the teacher's attitude toward the class and the instructional practices employed may have contributed to the unwholesome pupil reactions. It is, of course, possible that the teacher may have misinterpreted quite honest responses because of her own perverted, suspicious nature.

#### VI. IGNORANCE OF THE FACTORS CONTRIBUTING TO LEARNING DIFFICULTIES AND FAILURE TO CORRECT THEM

1. Many teachers lack systematic knowledge of the learning process. Consequently they do not make a constructive attack upon those conditions which contribute to the incidence of learning disability. Teachers should be familiar with the symptoms of various types of difficulties and should apply corrective measures at as early a stage as is possible. They must note the phases of the various subjects of the curriculum that present unusual difficulty to pupils and simplify the presentation of materials at these points.

2. Because of this lack of knowledge many teachers have tended to ignore the difficulties, with the result that faulty methods of work have become firmly established and the basic difficulty is in no way removed or corrected. There is no reason why the professionally trained teacher should not know how to diagnose the more common types of learning disability. In this Yearbook techniques of diagnosis that most teachers can learn to use with adequate skill are described. The schools must make provision for the analysis by competent experts of problem cases that present unusual difficulties for the teacher. Techniques are also described that should only be applied by those examiners who have had specialized training.

3. Until recently there has been no adequate effort made to ana-

lyze and classify in helpful ways the symptoms of specific or general types of learning difficulties. Little was known regarding the cruciality and significance of these symptoms. Methods of determining their presence and measuring their severity had not been developed. Until recently very little of this technical information was included in teacher-training courses. Teachers, therefore, have had no reliable basis on which to make a diagnosis; they have lacked ways of identifying precisely and accurately even the most common symptoms of disability. Faults were apparent in the work of pupils, but their true significance was not grasped. This condition should be greatly alleviated in the future, since the symptoms by which many types of disability can be identified are now known.

4. When a diagnosis has been made, the teacher is faced with the problem of selecting the most suitable corrective procedures. Thanks to careful experimental studies of the value of various remedial measures, we now have available a considerable body of information concerning effective methods of eliminating various types of learning difficulties. Just as in medicine, this treatment must be adapted to the needs of the individual; and just as in medicine, the application of faulty remedial measures may aggravate a fault whereas the application of the correct measure will remove the difficulty. When a given treatment does not lead to correction, the procedure must be varied until the solution is found. Teachers should be aided greatly in diagnostic and remedial instruction by the careful analysis of difficulties and by the methods of correcting them presented in the following chapters.

# CHAPTER IV

## EMOTIONAL AND SOCIAL FACTORS IN LEARNING

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### I. INTRODUCTION

It is generally recognized that learning is dependent upon both the characteristics of the learner and the external conditions to which he is reacting. Previous chapters have discussed some of the individual physiological and intellectual factors involved. In addition, personal factors such as instinct and emotion, as well as social factors such as group membership, rivalry, and coöperation, must be considered in relation to both the means and objectives of learning. The personal and social aspects of learning are intimately related and find a common meeting ground in the complex psychology of motivation.

### II. INSTINCTIVE AND EMOTIONAL BASES OF LEARNING

#### 1. Instinct

There is fairly general agreement among systematic psychologists that the term 'instinct' should be reserved for certain inherited tendencies to action that have a biological value for the continued existence of the individual. Instincts are responses that are originally set off by a relatively narrow range of stimuli. The operation of instincts is such as to place an individual in a position of readiness to respond to an appropriate range of stimuli and to engage in varied reactions until a consummatory response occurs that brings about an adjustment between the organism and the environment. Recognized tendencies of this type are commonly described under such terms as 'hunger,' 'thirst,' 'avoidance of pain,' 'temperature responses,' 'social hunger,' 'sex hunger,' 'excretory and secretory mechanisms,' and general tendencies toward activity resulting from some sort of sensory stimulation.

These instinctive responses, at first set off by a limited range of stimuli, may, through the process of learning, become attached to a wide and varied series of external situations. The teacher who is aware of the ever-present and pervasive nature of these tendencies

will have a fundamental grasp of problems of management that would otherwise be lacking. Some of the most intensive experimental work has been done with hunger for food. The restless, seeking movements in animals as a result of hunger have often been noted. Physiologists have been able to trace the course of hunger contractions in relation to food deprivation. On the behavior side, Goodenough<sup>1</sup> has illustrated how temper tantrums in young children are often associated with hunger. There appears to be a tendency toward an increased number of temper tantrums just before the usual feeding time.

## 2. Emotion

Since the responses in instinct are somewhat specific, investigators have found it advantageous to use the term 'emotion' for behavior which is characterized by an involvement of the organism as a whole.

a. *The Nature and Expression of Emotions.* 'Emotion' commonly applies to the feelings that the individual has during the course of an experience or to the overt symptoms that occur as a response to certain stimuli. Since there are many difficulties involved in securing objective personal reports of feelings, much of the recent research has emphasized the external situation or the bodily response to it. Important evidence on the nature of the emotions has come from the comparative study of animals, from genetic child psychology, from consideration of the anatomy of the nervous system, from physiology, and from abnormal and social psychology. Only a few of these types of evidence can be noted in this account.

Emotions in children are commonly recognized by the teacher through alterations in the facial expression, by blushing or paling, by trembling of the limbs, or by some vocal sign, such as laughing or crying. The experimentalist in the laboratory approaches these same problems by devising careful methods of measurement and by controlling the situation to which the individual responds. Experiments with children in the laboratory point to the existence of at least three large groups of emotional responses, which exist from an early age. A loud sound or the sudden removal of support will arouse typical *fear* responses, including catching of the breath, clutching, and crying. Restraint of the movement of the head or limbs results in *rage* responses, such as stiffening, striking, screaming, and flushing. Contact stimuli

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<sup>1</sup> Florence L. Goodenough. *Anger in Young Children.* (University of Minnesota Press: Minneapolis, 1931, 278 pp.)

involved in holding, rocking, and stroking result in a cessation of crying, and appearance of smiling and cooing. Such responses are considered the early expression of the emotion of *love*.

Many classifications of emotion are more complex than that just given, since experience and maturity soon increase the number and variety of experiences that will elicit an emotional reaction and also modify the form of the resultant expression. A number of writers contend that there is a place for a non-differentiated state of *excitement* in the classification of the emotions. In this condition the organism is in a general state of excitation and readiness for response, including feelings of elation or depression, without any specific emotion that might be designated as 'fear,' 'rage,' or 'love.'

Further understanding of the nature and expression of the emotions is obtained through the work of the physiologist or physiological psychologist. He may study the problem by recording changes in breathing rate, blood volume, pulse rate, bodily conductivity, glandular secretions, sugar content of the urine, or alterations in the contractions of the stomach and other portions of the gastro-intestinal tract. A number of the investigations suggest that an emotional reaction places the organism in a state of readiness for response by additional releases of energy. It has been demonstrated that the secretion of the suprarenal glands is stimulated in a variety of emotional states. The secretion, adrenin, appears to have a well-established function in stimulating the liver to the secretion of blood sugar, in slowing the coagulation rate of the blood, and in increasing the sensitivity of the muscles to nerve impulse. At times the advent of an emotional state is incapacitating, since the organism cannot make an adaptation by primitive flight or by attack. There is appearing an extensive, and often conflicting, body of literature on the functioning of the endocrine glands in relation to emotional behavior. Examples may be cited in the studies relating sluggishness in behavior to thyroid deficiency or excitability to oversecretion. The relation of gonadal secretions to emotional behavior is a problem of considerable theoretical and practical importance.

The evidence derived from the anatomy of the nervous system indicates that the response in emotions involves the autonomic system to a larger extent than it does the brain and spinal cord. The autonomic system is more primitive from the evolutionary point of view and functions in the regulation of essential vegetative processes, visceral reactions, and glandular secretions. While there are interrelationships

between the autonomic and cerebro-spinal system, there are also lines of cleavage. In this separation may be found some of the reasons why emotional expression is often comparatively unaffected by formal learning of an informational type.

Personal reports and case studies of individuals in abnormal emotional states have usually served as one of the basic approaches to both the understanding and treatment of emotional problems. A visit to any mental hospital will offer convincing evidence of the dominating character of emotional responses when not integrated and under control. Case studies illustrate how abnormal emotional responses become attached to situations that do not usually provoke such responses, and how individuals have reacted to shock, thwarting, and repression. The verbalizations of normal people concerning their emotional feelings make a definite contribution to the fascinating story of emotional reactions.

Thus we see that evidence from both casual observations and systematic investigations points to the widespread reverberations of emotional experience in the total behavior of the individual. It is not at all simple, however, to secure an accurate differential diagnosis of the emotional state. An infant may be stimulated to crying by the prick of a pin (pain), by food deprivation (hunger), by restraint of movement (rage), or by sudden loss of support (fear). If, however, a group of persons are asked to listen (without seeing) and to classify the crying according to the emotion that is being experienced, there will be very little agreement. The crying sign is not in itself differential, and therefore classification is often made in terms of the situation. An observer is usually assisted in judging emotional expression in others by a knowledge of the total setting. There is considerable evidence which suggests that with maturity children learn the conventional ways of expressing emotions just as they learn to read or write. The skillful reader or actor adopts the conventional alterations in voice, facial expression, and gesture to convey the emotion he wishes to express.

The work on conditioned emotional reactions is suggestive of the way in which objects and situations become capable of eliciting emotion.

*b. Conditioned Emotional Responses.* The investigations of the Watsons may be taken as illustrative of the laboratory experimentation with conditioned responses.<sup>1</sup> They were interested in determining

<sup>1</sup> John B. Watson. *Psychology from the Standpoint of a Behaviorist.* (J. B. Lippincott and Company: Philadelphia, 1924, pp. 231-236.)

first, what were the adequate stimuli to emotional responses; second, whether these responses could be evoked by other stimuli through a process of conditioning; and third, whether there was any transfer of emotional reactions to other similar situations. It was demonstrated that one of the infants used in the experiment regularly showed fear responses to loud sounds and the removal of support. He also reached for and manipulated anything that came within twelve inches of him. He had no fear of a white rat placed within his reach. An attempt was made to condition the child to a fear of the rat by striking a heavy steel bar behind him as soon as he reached for it. By repeating the presentation of the rat with the loud sound, the investigators demonstrated that the rat alone soon became a conditioned stimulus for the crying response. It was found that similar fear responses could be transferred to other furry objects. Regardless of the limitations of conditioned response theories in learning, the general formula of conditioning offers a practical basis for child management. Conditioned emotional reactions similar to the above commonly occur, whether by chance, by negligence, or by design, in the normal course of the development of children. Many children, upon entrance to the nursery school, must have their fear of doctors lessened by reconditioning. On some earlier occasion they may have attached doctors to a fear response previously elicited as a result of pain. Persons frequently report an emotional reaction to the telephone or to the receipt of a telegram when their chief association with such means of communication has been to receive bad news.

c. *Emotions in the School Program.* Emotional behavior has always been a central problem in human relations. Crimes are committed daily in a fit of uncontrolled emotion. Frequently the nature of these attacks attests their divorce from knowledge and intellect. On the constructive side we see emotions as the foundation for a happy family and social life, with an intimate relationship to such fields of experience as religion, art, and music.

There has been some discussion of a concept of 'emotional age,' somewhat analogous to that of mental age or achievement age, but at present we have no standard yardstick by which emotional age can be measured, although we may recognize differences in emotional maturity. We frequently say of the adult who flies into a rage upon slight provocation that he has 'failed to grow up.' Emotional maturity consists in part in inhibiting the overt expression of the emotions in non-adaptive ways and in expressing the emotion in adaptive ways.

A child cannot get along well in modern society if he goes about giving free expression to his whole repertoire of emotional reactions. He cannot flee whenever he fears. He must learn that the social group will not permit him to fight whenever he becomes angry. The mores will not permit free expression of his sex impulses. In other words, social groups have defined in rough outline certain patterns of behavior that appear to be useful for living together.

Ideally, education should preserve the positive, dynamic values inherent in emotional expression, while establishing the conformities that the mores demand. If there is a basic discrepancy, of course, between individual needs and social demands, the political or social philosophers may undertake to modify the social requirement. More often, perhaps, such social taboos as are based on ignorance or a mistaken interpretation of facts gradually disappear with the spread of scientific information and attitudes.

Much of the classroom management has been dominated by the conception that emotions must be repressed and made the tools of the intellect. This tendency is a reflection of community standards and an emphasis on intellect to the neglect of the feeling side of education. The newer knowledge of mental hygiene enables schools to make more constructive use of the emotional life of the child. At one time the powerful emotion of fear was used as the major technique of control. Physical punishment and threats of such punishment in the here or hereafter were some of the stimuli employed. We now know that fear produces reactions in the child which often unfit him, rather than fit him, for making appropriate adaptive responses. Excessive restriction of movement and speech in some types of the 'sitting and listening' schools favors emotional outbursts. Activity programs and approval techniques not only assist in the prevention of undesirable responses, but also tend to secure the emotional release of energy that comes through the general state of elation involved in smooth adaptive behavior.

A study of the emotions can contribute to teachers both a knowledge of what to avoid and what to do in the varied situations that arise in educational practice. A few examples must suffice to suggest some general principles.

Emotional breakdown of various degrees of severity may be observed in children at all ages. An example may be found in the pre-school child who broke down making an adjustment to a new nursery-school situation. His behavior was marked first by vasomotor disturbance indicated by a flushed face, then by a sequence of non-adaptive

acts, including an attempt to pull away from the adult, a verbal refusal, throwing himself on the floor, and bursting into tears. This pattern may involve many other variations, including striking, jumping up and down, threatening, and inarticulate vocalization. Among older children the counterpart of this behavior may be found in violent internal responses, with or without overt signs. The tendency, with increased age and learning, is to shift from a reaction of the organism as a whole to reactions of a part of it. The precipitating factor in such a situation may often be interfering with a response that has been initiated or be meeting a situation that is too complex for the adaptive mechanism. If we seek motivation, we may find it in past successes in securing desirable consummatory reactions from adults in the environment.

Any sudden and intense sensory stimulus is capable of eliciting emotional behavior to the extent of a paralysis of action akin to the death feint of animals. Thus, in one high school a girl fainted at a sudden explosion of a photographer's flash-light powder. Such situations can be avoided by preparation, which at least in part insures a state of readiness.

The careful observer of children in school may note overt evidences of tendencies toward responses in the field of sex behavior. These are particularly evident in classes with sedentary programs. Body-rocking, thigh-rubbing, manipulation, and flushing are commonly noted symptoms with younger children. Clinicians, through establishing confidential rapport with adolescents, gain introspective accounts showing the extent to which physiological factors lead to erotic phantasy. Sex offers a good example of a powerful instinctive and emotional tendency to reaction in which social factors modify the course of learning.

Some teachers unthinkingly plunge a child from an individual, small-audience, or recitation situation to a large audience of strange adults. From our study of the emotions we are not surprised if, on such an occasion, we find emotional blocking, with trembling knees, a dry mouth, and a 'blacking out' of the words the child expected to say. The understanding teacher expands the audience situation gradually, so that emotional behavior is not elicited in such a severe fashion.

A fundamental principle in management as related to emotions is that, once the energy releases involved in emotional reactions are set off, there must be some adaptive movement or there will be an emotional explosion. A child must be permitted to do something when he is in an emotional state or he will fly into a state of chaotic, maladap-

tive, emotional response, which may involve hitting, kicking, throwing, and similar symptoms. Some control of the symptoms is, of course, attained with age, but the principle remains fundamental.

Some children seem to be constantly oppressed by feelings of inferiority and inadequacy. Many appear to suffer from a more or less constant state of fear. Others are consistently egocentric. Others appear highly emotional and react in an extreme fashion to almost every situation. Still others appear to be emotionally unstable, and their responses are touched off by stimuli that for the normal person are entirely inadequate for the behavior. Additional description of the symptoms, mechanisms, and treatment for some of these patterns of behavior must await a more detailed discussion in a later chapter of this Yearbook.

Having thus considered learning from the standpoint of the personal characteristics of the learner, there remains the second operating principle cited at the beginning of the discussion—that of the external conditions to which the learner is reacting, or the *social factors*.

### III. SOCIAL FACTORS IN LEARNING

Social groups and institutions may be thought of as determining standards for conduct, as facilitating or inhibiting learning in general, or as contributing a unique body of information concerning problems of living together. The chapter of the Yearbook devoted to environmental factors in learning will consider some of the community organizations and institutions that are determiners of the child's total learning experiences. The section of the Yearbook that considers the social studies will deal with the informational aspects of the problem as involved in history, geography, citizenship, and related fields. The present section will sketch the unique function of the group in general learning situations and in defining the point at which individual behavior becomes a social issue.

#### 1. The Nature of Social Behavior

When we speak of social behavior, we are simply taking the spectator's or group participant's view of the behavior of an individual that also has its personal side. Since, however, a given person is constantly being modified by individuals and groups about him and is in turn modifying others, special examination of the factors in social learning must be made.

Under 'social behavior' we include responses elicited by social stimuli, such as the movement, expression, or language of others, and

also any behavior that is effective in arousing reactions in others, even though initiated by non-social stimuli. The operation of social behavior is often described as 'circular,' since the behavior of one individual produces a response in a second, and the behavior of the second again produces a response in the first. Vocal, facial, and bodily expressions are some of the media for social interaction. Social stimulation may transcend space and time through the written word or modern systems of communication.

Allport<sup>1</sup> makes a convenient distinction in the nature of social groups. In the *co-acting* group the individuals are primarily occupied with stimuli from outside the group. In the *face-to-face* situation the individuals react chiefly to one another. A group of children responding to the direction of the teacher would be an example of the first type. A group of children engaged in a discussion in order to resolve a conflict, or in a conference concerning the best method of furthering a project, exemplifies the other.

Sometimes a distinction is made between the terms 'group' and 'crowd.' In the latter the implication is that there is some type of release of normal repression, so that the behavior is governed more largely by the original instincts than is customarily the case for the individuals alone or in ordinary social settings. It is generally agreed that there is a facilitation involved in the stimulation received from others, which may exaggerate the reactions of individuals to the stimuli received. In the mob the reactions may go beyond ordinarily acceptable social limits. In the usual group such facilitations may be an advantage to performance.

## 2. The Effect of the Group on Learning

Individual work, mere membership in a group, the presence of an audience, competition, and coöperation are some of the variations in experimental settings that have been employed to determine the effects of social factors on learning. It is difficult to make broad generalizations concerning the contribution of these situations to learning, since the experimental procedures have varied so widely and the results have been contingent on the type of material to be learned.<sup>2</sup> The applica-

<sup>1</sup> Floyd H. Allport. *Social Psychology* (Houghton Mifflin Company: 1924), pp. 260-290.

<sup>2</sup> A recent résumé of the experimental data may be found in Gardner Murphy and Lois Murphy, *Experimental Social Psychology* (Harper and Brothers: New York, 1931), pp. 445-553.

bility of the results to educational practice is not always clear because of confusion in educational objectives and values.

Much of the experimentation has been done with co-acting groups. This may be a reflection of social and economic organization outside the school, of traditional ways of handling school settings, or of the greater ease of experimentation in such groups. In the typical experiment, the teacher or experimenter assigns a task in which some reward is offered for successful performance or in which there is deliberate competition among members of the group. The incentive may be a mark, a comparison with class standing, teacher approval, or any desired object or experience. Rivalry among individuals regularly increases output and speed of performance for the group. There may, however, be interferences with accuracy in complex tasks, and individuals are affected variously according to their emotional characteristics. Both rivalry and coöperation may be involved when groups are pitted against each other. While the desire to excel appears fundamental, and competitive practices in narrow experimental settings secure measurable results, there has been a growing dissatisfaction with individualistic educational philosophies and methods. Mental hygienists have criticized the procedures for their effect on the emotional adjustment of children of both superior and inferior ability, and social philosophers have questioned their desirability from the point of view of human relations.

Social, political, and economic planning in a democratic society place a premium on coöperation. Notable progress is being made at the present time in the suggestion of techniques for the resolution of group conflicts and for facilitating the processes of group thinking. An increasing number of schools are modifying their practices so as to avoid extreme competitive awards and to promote coöperation and interaction among the children. The experimental literature on the efficacy of face-to-face situations in learning and achievement is of timely interest.

Where information, attitude, or opinion is involved, it is clear that discussion methods are effective in making changes. Similarly, several experiments suggest that a small committee attack on a problem more often produces a correct solution than does the individual approach during a similar period of time. Group rejection of incorrect suggestions and acceptance of correct ones appear to account for some of the improvement. The amount of the group effect is dependent on the nature of the task. In tasks of a routine nature the total output of a group may be no greater than the sum of the contributions of the members working as individuals.

### 3. Social Learning

The effects of social groups must be sought not only in the facilitations discussed in the preceding paragraphs, but also in the way in which individuals learn to make subtle adjustments to the behavior of others as stimuli. While there are apparently large individual differences in capacity for making such responses, satisfying experiences in social settings seem to play an important part in the learning of successful social behavior. The psychology and sociology of the process is receiving intensive consideration in nursery-school groups at various centers in the United States.

A usable basis for the classification of adaptive behavior in school is a division into the withdrawing and attacking types. Both have social and emotional implications. In the first, a child tries to escape the situation by withdrawing into his own shell, by not reacting to the teacher or other children, and by a lack of participation. Contrasted to this is the so-called 'aggressive' behavior, in which the child participates and interacts by means of physical contact and language with the other children in the group. Each of these types may be further subdivided into constructive and destructive.

'Constructive withdrawal' is determined by a fundamental interest in doing constructive things that require individual approaches. Thus the young artist or scientist may frequently withdraw in order to pursue special interests happily and constructively. This would be contrasted with the withdrawal in which the child is subjectively unhappy, fearful, and non-responsive to stimuli. 'Constructive aggressive behavior' would be shown by the child who exercises some leadership, who coöperates on constructive projects, and who makes contributions to the work of the group. Under 'destructive aggression' would be placed the child who makes his social contacts by hitting, calling names, throwing things, and by unwillingness or inability to be controlled by any of the elements in the social or material setting. Duality in the nature of the adjustmental process is recognized in the various studies of intraversion-extraversion, ascendancy-submission, and compliance-resistance.

Both constructive withdrawal and participation are valued by the social group. Destructive withdrawal and destructive aggression are not commonly approved. In exaggerated forms they lead to incarceration in mental hospitals or correctional institutions.

#### 4. Failures in Social Learning

From the point of view of a social group an individual has failed in adjustment whenever there is a discrepancy between the way he acts and the standards of the group. Such standards may be embodied in customs, conventions, taboos, rules, and laws, and presumably serve some social or economic purpose. They are not constant in detail even within limited geographic areas or in small face-to-face groups. Rather uniformly, however, restrictions are placed upon an individual's freedom in the taking of life and economic goods. Such behavior is permitted only under defined conditions, even though the conditions may vary with the time and culture. Similarly, all societies have surrounded sex behavior and family life with a variety of customs and rules. Life, food, shelter, and reproduction are elemental individual and racial needs that every social group attempts to insure to each of its members for its own continued existence. Killing, stealing, and sex crimes attract the most attention and elicit the most severe punishment in our civilization.

Such failures of social adjustment may appear to be far removed from the behavior problems of the classroom. However, violent physical attacks, theft, and sex offenses are fairly common at school ages. More often, however, social maladjustment is indicated by a violation of rules, dishonesty, truancy, bullying, and outbursts of anger. The behavior in and of itself may often appear to be of trivial significance. Its import as evidence of failure in social adjustment can only be determined when interpreted in relation to the typical behavior of the group.

### IV. SOCIAL AND EMOTIONAL BEHAVIOR AND ACHIEVEMENT IN SCHOOL SUBJECTS

Variations in social and emotional behavior may be thought of as representing the end products of learning. They may also be thought of as interferences and facilitations in the orderly achievement of knowledge and skills in such school subjects as reading and arithmetic. The teacher will commonly be concerned with the problem from both points of view and will recognize that the two are often related. Examples of failures in social and emotional learning have been scattered through the chapter. A number of studies have been made to determine the extent to which the general behavioral adjustment is involved in educational adjustment.

Most efforts to rate or test social behavior, information, attitudes, and interests result in scores that give a unique contribution to the prediction of achievement in school subjects, but most efforts to measure emotional factors result in scores showing negligible correlations with achievement. Such evidence suggests that social adjustment (or the measurement of it) has more in common with learned acquisitions than has the emotional life. This view also receives support from the comparative study of races and cultures. Ample evidence supports the statement that emotional responses may be conditioned, but such modifications appear to be split off from general achievement to a larger extent than is social behavior. The statistics on socially maladjusted children show a tendency toward low intelligence and achievement scores, whereas emotional involvement occurs more indiscriminately among those of low, average, and high intelligence and achievement.

Current investigations fail to give convincing evidence of the importance of measured individual differences in emotional reactions in predicting the general level of achievement in school or college. This is probably due in part to the inadequacy of our techniques. Casual observations and clinical studies reveal qualitative data on emotional interferences with performance. Such disturbances may, however, be quite apart from the question whether or not the person has the necessary knowledge for the performance. The experimental studies of motivation give clear indications of the importance of instinctive and emotional factors in performance. The maintenance of a desirable level of social behavior, as well as the attainment of a desirable emotional adjustment for each child, is involved in the general psychology of motivation.

## V. MOTIVATION

'Motivation' is an inclusive term for those factors which in the individual and in the situation determine the nature of his acts. A 'motive' may be thought of as a type of stimulation that will initiate and sustain activity toward desired ends. Stimuli acquire the power of becoming an incentive in behavior and in learning in so far as reactions to them tend to bring about consummatory reactions for the original instinctive and emotional tendencies. It will readily be understood that such attachments become so numerous as to make motivation for any individual an exceedingly complex affair. In most experimental and practical situations an attempt is made to enlist the mechanism

of motivation through the control of the incentive that is the external and controllable feature of the process.

The most extensive contribution from the experimental point of view comes from the study of animals. Common incentives in such experimentation have been punishment by an electric shock, food, hunger, sex (including maternal behavior), and a group of miscellaneous discomfort stimuli. Many of these have been studied singly and in combination. Experiments with human beings use various types of punishment, particularly electrical shock, and physical objects, such as toys, food, and money. Social incentives, such as rivalry, knowledge of success, approval, and reproof, have been employed. Rather regularly experimentation with incentives of the foregoing types yields positive results. Detailed discussions of the applications of the findings to classroom practices may be found in the various textbooks on general method.

Stimulating suggestions for the intensive student of environmental management may be found in the theoretical formulations and experimental studies of Lewin.<sup>1</sup> He develops a conception of *field forces* that have both direction and strength and that may be represented graphically as *vectors*. The forces have *positive valences* when they effect approach and *negative valences* when they produce withdrawal. Behavior towards a goal is dependent on the structure of the field forces. The strength of the positive valence between a child and an incentive is dependent on the child's internal state as well as on the strength of the external incentive. By putting a barrier between the child and the goal, experimental variations may be introduced. If the incentive is too strong, detour behavior may be interfered with, and the child struggles vainly against the barrier. If the positive and negative valences are balanced or rapidly alternating, conflict in action or withdrawal from the field may occur. Many helpful deductions for educational practice follow from the general principle enunciated.

Current educational theory and practice place an unusual emphasis on the importance for motivation of the instinctive tendency to reaction in response to stimulation and on the general state of emotional excitability described as joy or elation. Release of energy with a consummatory reaction in movement are characteristic of both. Activity and elation are components of the play of children and adults. In the schools of the past this tendency toward activity was often thwarted

<sup>1</sup> Kurt Lewin. "Environmental Forces." In *Handbook of Child Psychology* (Clark University Press: Worcester, Massachusetts, 1933) pp. 590-625.

or at least restricted to relatively narrow ranges of responses. Innovating practices in modern education today seek to enlist this tendency toward action in a variety of ways. There is also some reason to suppose that there is a better integration between knowledge and performance in programs in which expressive movements and social interaction are permitted. Both the possibilities of such programs and the need for direct experimentation on outcomes are indicated in the preceding Yearbook of this Society, dealing with *The Activity Movement*.

Periods of intense activity are commonly followed by intervals of relative quiescence. Rest and responses requiring a low rate of energy consumption must, therefore, be allowed for in school programs. In all motivation the internal state of the child must be taken into account. It would be incorrect motivation to stimulate a child to action by external stimuli when his needs are for comparative inactivity. Similarly, correct principles of motivation would be violated when there are unnecessary interferences with activity or restrictions upon it.

#### VI. REFERENCES

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# CHAPTER V

## ENVIRONMENTAL FACTORS CONTRIBUTING TO LEARNING

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The environment in which children live influences to a marked degree the type and quality of learning in the school. General community facilities and neighborhood characteristics affect all of the children in the schools, although in different amounts. Certain other elements of the environment, such as the characteristics of the child's home and his experiences outside the school, vary widely for different children and affect them differently. Thus the environmental factors may be considered broadly under two classes: (1) those which affect all children, and the improvement of which, in consequence, will result in improved learning by all children, and (2) those which affect individual children, which affect them in different ways, and which, therefore, must be discovered and considered with reference to each individual child. Obviously the difference between these two classes is one only of degree. The existence or absence of a public library and the type of public library available do affect potentially all children and in substantially the same manner. However, the type of library service available affects the learning by individual children differently in terms of the distinctive characteristics and needs of these individual pupils. Nevertheless, the broad classification here suggested may be helpful to thinking.

### I. COMMUNITY AGENCIES AND CHARACTERISTICS

The community factors that affect learning may be grouped under three headings: (1) the public agencies, (2) the private commercial agencies, (3) the organizations in the community that affect learning more or less directly, and (4) the characteristics of the neighborhood.

#### 1. Public Agencies

*a. The Library.* Among the public and private agencies, the school is unquestionably the one that dominates the learning process. Never-

theless, many others are influential. The opportunity for the public generally and for children in particular to secure books and magazines is especially important. Public libraries have grown in number until in 1930 there were 5364 libraries in the United States. Large as this number is, it should be noted that there are 6251 towns with a population of over 1000, according to the 1930 census. It appears that one out of six of these towns has no public library. The schools in such communities are handicapped. Children in those schools do not have the stimulus of seeing older people use the library, nor do the children experience the satisfaction of having public library cards and of selecting and reading books under the normal conditions of adult life. School people in such communities may well devote time and energy to developing a community consciousness of need of library service.

Even in the cities that have public libraries the facilities may be grossly inadequate. Children can scarcely be expected to go much farther to a branch library than to school. Yet few, if any, cities have as many branch libraries as schools. Furthermore, the libraries may not make appropriate provision for children of different ages.

From the point of view of school people interested in diagnosing and meeting children's needs, the existence of public-library facilities and the type of the facilities cannot be disregarded. If there is no library or not enough libraries, the school group can aid in building sentiment for increased service. If relatively few children are using the library even after much stimulation from the school, the selection of books for children may be faulty or the mechanics of making books available may be wrong. In either case, the teacher and superintendent have some responsibility for securing improvement in the library service. When children live a great distance from the library, loans of books may often be secured and placed in the school for circulation to children just as if the children had gone to the library itself. Such loans may be temporary—for a semester or two—or they may be permanently housed in the school. Fortunately, the tradition of the library is *service*. Librarians are generally very willing to coöperate with school authorities.

*b. The Art Institute.* The art institute is another public agency that may contribute greatly to the learning of children. The modern school seeks a well-rounded development in its pupils. Since the fine arts have a large and growing place in education, the community that has facilities for school children to view and learn about fine paintings, sculpture, and other objects of art is enriching the education of

its children. Again the function of the teacher is to help to provide such facilities in the community and then to use them to the utmost after they are provided. Admittedly, the art institute is unlikely to be found in smaller communities, but nearly every teacher can discover through search some things of beauty that should be seen and known and enjoyed by school children.

*c. Music.* Fine music, commonly financed by civic groups and wealthy individuals, is perhaps less frequently supported by public funds than are libraries and institutes of art. Yet the symphony orchestra and the city band may supply needs in the field of music. In Detroit, for example, the Detroit Symphony Orchestra gives annually a series of children's concerts. Programs are arranged in co-operation with the music department of the public schools. The musical numbers to be played are studied in the schools by the aid of phonograph records. Finally, free tickets are provided school children, groups of whom come from every school in the city to hear the concerts. The project has worked out very well in Detroit; the experience of good music in appropriate surroundings could scarcely be provided by the public schools alone. Children need such experience if they are to develop a lasting interest in music and to grow in power to appreciate good music.

*d. Parks.* The public parks likewise may be a factor in children's development. In cities particularly, where there is all too little chance for children to have basic experience with grass and trees and flowers, the public park often affords their only opportunity. In addition, the public park is usually a good example of landscape design and thus is useful in connection with the learning of art. Occasional parks contain zoological collections that extend to children experience with the animal world. Nature study, biology, botany, general science, and art, all can be taught with greater reality if public parks are available as outdoor laboratories.

*e. Playgrounds.* Public playgrounds, sometimes a part of the school plant and sometimes independent of it, grow in significance as safety habits and the wise use of leisure become increasingly important goals of education. Likewise, the development of interests and skill in many outdoor activities calls for appropriate space and equipment, not only during school hours, but also after school and during vacation periods. The modern school seeks to develop enjoyment and control of various games and sports, like tennis, golf, archery, and horseshoes, that can be continued through most of the adult years. Playgrounds

and athletic fields, to be of service for all the children, must be publicly controlled.

School people are inevitably concerned with the amount and kinds of public facilities available for the enrichment of child and adult life in the community. If the service of libraries or playgrounds or other agencies is inadequate, the development in school children of good reading habits, appreciation of the beautiful, interest in nature, enjoyment of sports and games, and the like, may suffer. In such a case an important type of remedial service may be the stimulation of the community to a realization of the necessity for improved community facilities for all the people.

## 2. Private Commercial Agencies

Another group of agencies influencing children's development includes the press, the radio, the movies, the beer garden, the theater, and the dance hall. From one point of view, such agencies are even more difficult for school people to influence than are the public agencies. Nevertheless, teachers and superintendents should recognize their influence and wherever possible secure improvement in the effects upon school children.

*a. The Press.* The press has become a potent force in American life. Recent figures indicate that upwards of thirty-five million newspapers are sold daily in this country, an average of one per family. Studies of reading habits of adults and youth show that the average adult devotes more time to the daily newspaper than to all other types of reading put together. Obviously, children are affected by the newspapers they read and, indirectly, by the newspapers read by their parents. For example, an attempt made by the school to develop international understanding and to promote the attitude of peace is very difficult to accomplish in a community dominated by a nationalistic, jingoistic newspaper. In another community, where the leading papers are animated by a desire for "peace on earth and good will toward men," the same effort in the school may be most fruitful. The press is a force to be reckoned with.

*b. The Radio.* The radio also is very influential. It is estimated that in 1933 eighteen million homes, or about sixty percent of the total number, in the United States were equipped with radios. The typical home has available at the twist of a knob three or four different radio programs. And how different the programs are! Music of every kind and style, plays, stories, humorous dialogues, speeches on every con-

ceivable subject, sermons, reports of all kinds of athletic games and events, follow one another in chaotic succession. Interspersed are advertisements of beer, shaving cream, dance halls, gasoline, and every other thing or service that is for sale. The radio provides a great reservoir of learning opportunities — good, bad, and indifferent. Its influence depends upon the selection that is made. The school does appear to have a responsibility for developing in its pupils some standards of selection and some skill in making wise choices. Also the school can influence the local programs in many communities.

c. *The Theater and the Motion Pictures.* The theater and the motion pictures, particularly the latter, constitute another commercially controlled influence upon children's learning. The Payne Fund Studies<sup>1</sup> reveal that the motion picture is a potent source of education, that for children the content of current pictures is not good, and that the situation is most complicated. Young children see half the facts in a picture and remember them for a surprisingly long time. Their attitudes may be changed even by a single exposure. Their sleep is affected. In 1930, the themes of feature pictures were love, 29.6 percent; crime, 27.4 percent; sex 15.0 percent — scarcely a desirable balance for children. Studies of audience make-up show that 17 percent are children under 14 years of age and that 37 percent are minors. Children about 7 years of age attend movies once a week on the average. From age 8 to age 19, 27 percent of the boys and 21 percent of the girls attend twice or more a week. Pictures are apparently planned primarily for adults, although more than a third of the audience consists of minors. As in the case of the radio, selection is clearly of great importance. The school cannot but be concerned with what the children learn through the motion pictures.

The private commercial agencies that have been mentioned here are all beyond the direct control of the school or even of the organized public. It is true that in countries like Great Britain the radio is controlled by the government and is used for the well-being of all the people rather than for the profit of a few. In this country, however, the radio, the movies, the theater, and the press are subjected to relatively little social control. Under these conditions, the school would appear to have a large responsibility for developing in children good taste and power to discriminate in selection. For many years, schools have sought to develop discriminating readers. It is no less important

<sup>1</sup> W. W. Charters. *Motion Pictures and Youth: A Summary.* (Also eight other volumes by various authors, New York: The Macmillan Company, 1933)

for the school to develop habitual choice of the best in the radio, the motion pictures, and the daily paper. The work of the Committee on Motion-Picture Appreciation of the National Council of Teachers of English is an illustration of what needs to be done in all these fields.

### 3. Community Organizations

Every community has a host of organizations that influence more or less directly the education of children. Some of these organizations are made up of children and youth; for example, the Boy Scouts, the Camp-Fire Girls, the Y.M.C.A., the Y.W.C.A., the Y.M.H.A., and the Girl Scouts. Each has its own program, its own leaders, its own special purposes. Yet each influences children who are also under the influence of the public schools. From the point of view of diagnosis and remedial work, perhaps the greatest significance of such organizations is the opportunity afforded schools to have children with special needs placed in extra-school groups that appear able to minister to their needs. Child-guidance clinics and similar agencies frequently use youth organizations in this way. The school may very well capitalize similarly the groups in existence in the community and may even stimulate the formation of needed groups. At the same time, it must be recognized that some children are overstimulated by having too many outside activities in progress and need guidance toward a quieter and simpler life.

Churches, Sunday schools, and parent-teacher associations are other types of organizations that affect children. For example, churches often seek to inculcate good character just as do the schools, except that the church has available the added sanction of religion in its work. Parent-teacher associations afford opportunity for parents to understand the school better and for teachers to understand the home better. These associations can be counted on as real friends of public education. Women's clubs generally, and particularly certain ones, such as the American Association of University Women, are concerned with the welfare of education, and support the school authorities in efforts for the good of children.

Special-interest groups, more or less directly commercial in nature, concern themselves with education and often affect what and how children learn. The bakers wish to have the schools teach the value of bread and baked goods. Dairy and food councils offer much material supporting the use of dairy products. Motion-picture houses endeavor to have their feature pictures advertised in the schools. Labor

unions seek to have taught the right of labor to organize. Chambers of commerce endeavor to have the principle of the 'open shop' presented favorably in the schools. Certain societies urge big navies and standing armies; others urge the approach to peace through disarmament and international understanding. The school is under a continuous barrage from these and numerous other propaganda-spreading agencies. The implication of all this for diagnosis and remedial teaching is that much that the school considers false concepts and harmful attitudes in children is due to the propaganda of special-interest groups. This fact must be recognized before the school can apply appropriate correctives.

#### 4. Neighborhood Characteristics

The general atmosphere of the school neighborhood influences the effectiveness of the school program. The degree of homogeneity of the people as regards race, nationality, religion, occupation, and language; the frequency of crime; the uses made of leisure; the types of houses—whether single or multiple dwellings; the economic level of the homes; the existence of factories; the presence of parks and playgrounds—all have a bearing on the work of the school.

*a. Homogeneity.* The typical urban neighborhood today is highly heterogeneous in make-up. Persons of different religious faiths and of different national extraction, persons engaged in widely varying occupations, persons who speak different home languages, persons of differing economic level live in the same neighborhood and send their children to the same school. This situation is at once a source of problems and an opportunity for training in human relations. Many adults have never learned to respect and to coöperate effectively with other adults who differ from them in important characteristics. In consequence, the friction and aloofness among older people is often communicated to the youth of the neighborhood: this constitutes the danger. At the same time, however, this same situation gives the school at its very door a laboratory in human relations, a place in which children may be taught to live and work effectively and agreeably with persons unlike themselves. Such an outcome is to be highly valued under conditions of present-day urban life.

Not all school neighborhoods are highly heterogeneous. Some are very homogeneous, especially in economic level. But such neighborhoods present their own problems. The school must provide artificially or vicariously the experience that all children need with persons unlike

themselves in order to develop the social abilities requisite in modern life.

*b. Fluidity of Neighborhood.* School communities differ greatly in the degree of permanence of the population. Thus a study<sup>1</sup> in Detroit in 1925, under relatively normal conditions as compared with later years, revealed that the percentage of children transferred out of elementary schools during the year ranged from 2 percent to 95 percent of the school membership. The distribution is shown in Table I.

TABLE I. NUMBER OF ELEMENTARY SCHOOLS WITH GIVEN PERCENTAGES OF PUPILS TRANSFERRED OUT DURING SCHOOL YEAR

Percentage Transferred	Number of Schools
90-99 .....	3
80-89 .....	1
70-79 .....	4
60-69 .....	7
50-59 .....	10
40-49 .....	32
30-39 .....	53
20-29 .....	31
10-19 .....	5
0-9 .....	7
<i>Median</i> ... 36.3	Total ..... 153

In general, the neighborhoods with low transfer rates were areas near the outskirts where people lived in single homes and owned them. Neighborhoods with high transfer rates were made up chiefly of rooming houses and furnished apartments. Evidently the task of the school in diagnosis and remedial work varies with the degree of permanence of the school population. Schools with relatively fixed membership can have long-term programs of individual study and correction. Schools with a high turnover rate must plan for much shorter units of diagnosis and treatment. Furthermore, such schools need to give special attention to written records of what is done in diagnosis and treatment, so that accumulated information about a particular child may be passed on with him when his parents move to a new community and he attends a different school.

The mobility of a neighborhood, especially when associated with a

<sup>1</sup> Unpublished study in files of Department of Research, Detroit Public Schools.

transitional character, is particularly significant from the point of view of the incidence of juvenile delinquency. Shaw<sup>1</sup> and Elmer<sup>2</sup> have shown that delinquency rates vary widely among the areas of a single city. Thus, in Chicago, Shaw found a very high delinquency rate in the areas surrounding the central business district and near the stock yards and steel mills, but a relatively low rate in residential areas remote from the business and industrial district. Significantly enough, Shaw found that high rates of delinquency had persisted in certain areas over a long period of years, although the racial and national make-up of the population residing in the areas had changed several times during the period. Furthermore, when children moved out of these areas their tendency toward delinquency diminished.

## II. HOME CHARACTERISTICS AND EXTRA-SCHOOL EXPERIENCES

### 1. Home Characteristics

The success of an individual child in school reflects, to a degree at least, all his experiences outside school, especially the *type of home* in which he lives. The class or school may have but one child whose home language is not English, but for that child the fact may have large significance for his success and happiness in school. Throughout his school life the control of the English language is essential to satisfactory work. If the child uses English only in school and on the play-ground, he is surely handicapped in learning to read and in taking part in any activity that calls for language. Cities with large numbers of foreign-born children commonly provide special classes to teach English to foreigners. In school communities with but occasional cases of need to learn English, the problem must first be recognized and then individual coaching and special language opportunities provided.

The *economic status of the home* is another factor in the learning situation. Even though public education is free, there are many items for which parents commonly must pay, including lunches, special trips, admission to games, and books. At all times there are many families without means for such extras. During the depression following 1929,

<sup>1</sup> Clifford R. Shaw. *Delinquency Areas* (Chicago: University of Chicago Press, 1929, 214 pp.)

<sup>2</sup> Manuel C. Elmer. *The Juvenile Delinquent in St. Paul*. (St. Paul: The Community Chest, 1926, 48 pp.) See also *The Delinquent Child*. Report of the Committee on Socially Handicapped-Delinquency of the White House Conference on Child Health and Protection. (New York: The Century Company, 1932, 499 pp.)

the number of families of this type became very large. For example, in Detroit during the spring of 1933, out of approximately 250,000 children in the public schools, more than 20,000 had to be given free lunches daily. During the year 1932-33, 17,550 new pairs of shoes were provided for poor children, and 890 were furnished eyeglasses. Shoes to the number of 269,364 pairs were repaired free of charge for indigent families. In addition, at the peak, over 50,000 families were supplied with funds for food, shelter, and clothing by the Department of Public Welfare. The effect of such conditions upon the feeling of security and the emotional balance of the children is difficult to estimate, but seems certain to be bad. Steps were taken to avoid any distinction in the school between children receiving aid and the other children, but the children who received aid were in many cases conscious that they were different from the others.

Even though a family may be able to feed and clothe its children, it may yet be unable to supply the small extra funds for school activities. The school gets out a little newspaper, but some children are unable to buy copies; the class takes a bus trip to the art institute, but some children cannot go because they do not have bus fare; a school pageant is held, but some children cannot get money for the simple costumes required. Can a child maintain his self-respect, his pride of family, and his sense of belonging to the school social group under such conditions? Can his attitude toward his school life be quite normal?

Another environmental factor of importance is the *degree to which the home life is normal*. In one class of fifth-grade pupils where many children seemed maladjusted, the teacher found that seventeen of the forty-two children came from broken homes and lived with only one parent, with one parent and a step-parent, or with some other relative. In another instance where a boy was becoming a problem in school, the teacher discovered that the boy's father had died, the mother had married again, the mother had died, the step-father had married again, and the child was living with a man and woman who were not related to him at all.

The *attitude of the parents* toward work, toward law and order, toward common honesty, is bound to influence the child's attitude. One boy wrote a composition on "How I Learned a Lesson." He described how he had begun by taking pencils, knives, and other small articles from his schoolmates. When he displayed them at home, his father only laughed and tended to encourage him. Later he took a girl's silver wrist watch. When he showed that to his father, he was punished and

forced to return the watch. He concluded his composition as follows: "That taught me a lesson. I never take big things any more."

The relations between parents and children and among the children themselves vary greatly. The case of the child who has other young brothers or sisters who surpass him in school is far from uncommon. Unless the parents are very wise in their handling of such a child, the chances are good that he will become embittered and unhappy. Or consider the case of the unwanted child, like this one:

A woman who already had two sons and craved a daughter went to a hospital for child-birth. The child was born but it was another son. Even when the babe was brought to her daily, she turned aside and refused to look at him or touch him. The father likewise refused to see the child. After two weeks in the hospital, the mother went home, leaving the child without ever having seen him. The father told the hospital authorities that in a few days the grandmother would come for the baby. What will be the effect upon the child when he discovers the situation?

Children differ, not only in height and intelligence and reading ability, but also in home life, and the effect of the latter upon school success and happiness in life may be greater than the effect of the former. The teacher needs to be alert to the characteristics of the home and be ready to make whatever adjustments are possible in the school to utilize the strengths and compensate for the weaknesses of the home. The practice of having the teacher visit the home of her pupils as frequently as possible is most worth while and should be revived and extended.

## 2. The Pupil's Other Extra-School Experiences

Children differ also in the other types of experiences they have had. For example, some children at the time of their introduction to arithmetic have had much *contact with money*; others have had practically none. A few have an allowance and know something about spending money, although their experience with earning money may be nil. Others go regularly to the store for mother, have a concept of values, know the different pieces of money, and understand something of the making of change. Still others have never had money to handle and use.

Some children have earned money in various ways. Thus a survey of street trades in Detroit in 1931 revealed that approximately one in twelve of the pupils enrolled in Grades II-IX was at that time engaged in street trades — selling or delivering newspapers, magazines, etc.

Over 90 percent of the street traders were boys, but there were some girls. Children of every age from six to eighteen were found engaged in the work. The average number of hours worked per week ranged from 6.5 hours for seven-year-olds to 19.5 hours for seventeen-year-olds; the average weekly earnings increased from \$0.38 for seven-year-olds to \$4.67 for seventeen-year-olds. Ranges for individuals were, of course, very wide within each age group. These facts suggest the great differences in the experience that elementary-school pupils have had with work and the earning of money. The eight-year-old who has made change ten or twenty times a day for six months is much more nearly ready for the processes of arithmetic than another child of the same age whose experience with money has been more limited.

*Work* is itself a valuable experience that children have had in widely varying degree. In the early grades few children can be expected to have engaged in remunerative work. Even in the later grades compulsory attendance laws, and more recently the codes, have made it difficult for minors under eighteen to get work. Nevertheless, some children do have work to do in their parents' businesses, and occasionally they secure work as messengers, extra clerks in stores, and so on. As suggested in a foregoing paragraph, a rather large number work in the street trades. The significance of these facts for the school is that another type of difference in children is revealed. Those who have had experience with work have an appreciation of responsibility for a job that is distinctly valuable. Furthermore, they have a new understanding of people and human relations generally. One way in which the school can capitalize such differences is by inviting special contributions in the social studies from pupils who have some experience in the world of work. Fortunately these children are frequently the ones who are handicapped in other ways and who will be benefited by having an occasional opportunity to display their distinctive knowledge.

Children differ greatly also in the degree to which they have learned through *travel*. In a large city like Detroit the number of children in the third grade who have never been down town or who have never visited the principal parks is amazing. In this grade the pupils are studying local geography, yet a large number have had no direct experience with many of the items about Detroit of which the course treats. Remedial teaching for such children involves the provision of basic experiences about their city. The situation is similar when larger areas are considered. The child who has been able to take an automobile trip around the lower peninsula of Michigan and who has driven

beside Lake Michigan for an entire day has an appreciation of the size of this lake that can be secured in no other way so adequately. The school's task in supplementing the experience of other children who have had no such opportunity is difficult, but necessary if instruction is to be well-balanced.

In the field of *reading*, again there are great differences in the environmental influences upon children. Some children have available in their homes one or more daily papers, several magazines, and a small library of books. They grow up in an atmosphere where reading is taken for granted. The child who does not have these opportunities needs special attention in the school if he is to develop interest and facility in reading.

The new emphasis in the schools upon training in the wise use of leisure suggests another area in which differences are great; *i.e.*, contact with varied ways of spending spare time. If the home neighborhood has many persons interested in making attractive lawns and gardens, children insensibly accept the beautification of the home surroundings as one way of using leisure. If the child's parents are themselves interested in tennis, fishing, baseball, and other games and sports, the child too develops many such interests. If his relatives and friends like to collect stamps, or build radios, or play musical instruments, or make things from wood and iron, he is the more likely to take up such hobbies. The school can well encourage the community generally to develop many leisure-time interests, if for no other reason than the support thus secured for the school program of training for leisure.

### III. SUMMARY

This entire chapter calls attention to the many environmental influences upon the child. The school dare not work independently of these factors, but should make periodically a survey<sup>1</sup> of the general conditions in the community. On the basis of the findings various steps may be taken. Gaps in requisite governmental service may be brought to the attention of the proper authorities and when necessary a campaign for extension may be launched. Specific activities may be instituted in the school program to develop in children the power to select intelligently among the many possibilities offered by commercial agencies such as the radio and the motion pictures. When the general com-

<sup>1</sup> See, for example, John S. Thomas. "Studying the Community." *The Principal and Administration*, Ninth Yearbook, Department of Elementary School Principals, N.E.A., Washington, D.C., 1930, pp. 605-612.

munity influences are impossible to change, the school may need to introduce new activities calculated to take the place of desired facilities that are lacking, or to compensate for harmful influences.

In addition to making a general survey of environmental conditions, the teacher needs to gather the facts about the extra-school experiences of her individual pupils. She should know, as far as possible, the special conditions in the lives of her pupils which affect their growth and development in school. Only on the basis of such understanding can she hope to make appropriate adjustments to individual needs. These adjustments may take the form both of supplying experiences that are wanting and of building on the experiences that the child has had. Diagnosis and remedial work can scarcely be limited to the immediate and direct activities of the school and class, but must be applied to every influence upon children's development.



## *SECTION II*

### **PRINCIPLES AND TECHNIQUES OF EDUCATIONAL DIAGNOSIS AND TREATMENT**

Section I presented a comprehensive analysis of factors associated with learning difficulty. It was made clear that in any given case one or more of these factors might be contributing to faulty or inadequate growth.

The purpose of Section II is to discuss the general principles and techniques of determining which one or ones of the factors may be operative in ineffective learning. It is pointed out that diagnosis must begin with a clear conception of the objectives to be achieved by the educational program. The extent to which these objectives are not being achieved affords a valid basis of diagnosis. In the past two decades there has been a rapid development of methods of diagnosis of learning inadequacy. In recent years definite attempts have been made to evaluate and refine many of these techniques.

Dr. Tyler presents concrete standards for evaluating a diagnostic procedure. Drs. Brueckner and Buswell describe and evaluate specific techniques that have been devised. Because of recent significant findings by Dr. Courtis on the relation of maturity and growth in the learner, it was deemed advisable to discuss the relation between his findings and diagnosis. Section II concludes with a discussion of basic principles of preventive and remedial instruction, the application of which to specific fields of learning is taken up in Section III.

## CHAPTER VI

### CHARACTERISTICS OF A SATISFACTORY DIAGNOSIS

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This chapter has been written both for producers and consumers. In making diagnosis one needs to appreciate the characteristics that make the diagnostic procedure satisfactory. Frequently, important characteristics are neglected and an inadequate diagnosis results. Furthermore, teachers and administrators who utilize the results of educational diagnoses made by others need to use standards for judging the quality of the diagnoses. The characteristics discussed in this chapter should suggest the qualities expected of an effective diagnosis.

#### I. THE IMPORTANCE OF THE OBJECTIVES

The making of a diagnosis is essentially the task of locating more specifically those factors which bear some causal relation to the progress in learning of a pupil or a group of pupils. For example, one may make a diagnosis in handwriting by discovering that a pupil's difficulties are partly caused by his tight clasp of the pen; a diagnosis might be made in the social studies by determining which pupils were developing the ability to recognize social problems in current affairs; or a diagnosis might be made in grammar by determining what rules of grammar the pupils did not recall. From these illustrations it is clear that any kind of learning may be diagnosed, whether or not that learning is important or desirable. Just because it is possible to discover the particular rules of grammar that a given pupil fails to remember is not a complete reason for making such a diagnosis. The first question should be: Should this pupil recall rules of grammar? If this is not an important objective of language instruction, there is no reason why any diagnosis should be made to locate more specific causes for the failure to achieve this objective satisfactorily. If educational diagnosis is to be a handmaiden to effective teaching, it is first essential that diagnoses be made in connection with worthy objectives of a good educational program.

The requirement that educational diagnosis be concerned with

worthwhile objectives has sometimes been overlooked. There are cases in which unimportant or trivial outcomes of learning have been diagnosed while important objectives have been neglected. In reading, for example, some teachers have paid more attention to the discovery of the specific words the child could not pronounce properly than they have to those kinds of experiences the lack of which may prevent the child from comprehending the meaning of certain reading materials. Yet, in most reading, adequate comprehension is more important than proper pronunciation. Some natural-science teachers have been more concerned with a diagnosis designed to reveal the particular animal or plant structures that the student could not name than with the discovery of the major generalizations that the student understood so incompletely that he could not use them in interpreting new scientific phenomena coming to his attention. In making diagnoses, this tendency on the part of some people to neglect the most important outcomes of learning is one of the reasons why some thoughtful students of education have criticized programs of educational diagnosis.

Even though some educational diagnoses may have contributed little, or have been harmful, the potential positive value of diagnosis as a method does not stand or fall upon particular illustrations of its unwise use. Educational diagnosis emphasizes the fact that pupils in learning may not react to all of the elements of the learning situation with equal effectiveness, so that the resultant learning may be inadequate in various respects. In trying to develop a well-rounded series of educational outcomes, it is often more economical to attend particularly to those aspects of learning which have not yet been satisfactorily developed rather than to distribute attention over the entire field. The essence of educational diagnosis is the identification of some of the causes of learning difficulty and some of the potential educational assets, so that by giving proper attention to these factors more effective learning may result.

If diagnosis makes more effective learning possible, the method should not be wasted upon trivialities. The value of a program of diagnosis largely depends upon the significance of the outcomes which are the subject of diagnosis.

This is well illustrated by a case which recently came to my attention. In a certain high school the algebra teacher was much interested in diagnostic work. She made a very careful analysis of the work done in the mechanics of algebra. Her record in factoring, for example, showed which pupils were unable to factor each type of expression,

such as the sum of two squares or the difference of two squares. A great deal of effort was expended in developing remedial work for pupils encountering difficulty in factoring or in other aspects of algebraic manipulation, but no attempt was made to diagnose difficulties in representing the conditions of a problem by an algebraic expression. The ability to express quantitative ideas in algebraic form is much more important as an objective of algebra teaching than is the ability to factor various types of complex algebraic expressions.

The first criterion to apply to any program of diagnosis is the value of the educational outcomes which are the subject of diagnosis.

## II. VALIDITY

A second characteristic of a satisfactory diagnosis is validity. Validity in this sense means that the diagnosis really gives evidence of causal factors related to the attainment of the objectives in question. In the field of health education, for example, an important objective is the development of certain habits of personal hygiene. Furthermore, it is possible to weigh pupils and to determine their percentage of overweight or underweight. However, this procedure does not give a valid diagnosis of hygienic habits, for it does not give evidence of causal factors related to hygienic habits. It is quite possible for pupils to be either underweight or overweight and at the same time to have very desirable personal habits or to have very undesirable habits. As another illustration, an objective of certain advanced courses in college zoölogy is to develop skill in the laboratory techniques of dissection. It is quite possible to administer a typical intelligence test to students in these advanced courses, but a typical intelligence test does not give a valid diagnosis of the students' skill in laboratory techniques.

Investigations by Buswell and John<sup>1</sup> and by Burge<sup>2</sup> have shown that the attempt to diagnose children's difficulties in arithmetic by inspection of the test papers was reasonably valid for detecting kinds of examples that they could or could not solve correctly, but the method was not valid for determining the mental processes involved in the children's methods of work. Inferences as to the processes were frequently in error. On the other hand, these investigators found it pos-

<sup>1</sup> G. T. Buswell and Lenore John. *Diagnostic Studies in Arithmetic*. (Supplementary Educational Monographs, No. 30, University of Chicago, 1926).

<sup>2</sup> Lofton V. Burge. "Types of Errors and Questionable Habits of Work Involved in the Mechanics of Multiplication." (Unpublished doctor's dissertation, University of Michigan, Ann Arbor, 1932.)

sible to discover many of the mental processes followed in solving arithmetic exercises by interviewing individual pupils and asking each one to do all his work aloud as he solved the various examples. Additional questions were asked when the examiner was in doubt as to the method of work the pupil was following. This illustrates the fact that a method of diagnosis may be valid for discovering certain factors, while not valid for discovering other factors.

In the field of English composition, Willing<sup>1</sup> conducted an intensive study of the validity of several tests commonly used for diagnostic purposes. These tests involved error correction or proof-reading, error recognition, or alternate word choice. The tests were checked against the actual errors made in compositions written by the same children. The correlations between the total errors on the tests and the total errors on the compositions did not exceed 0.74. This indicates that these tests were not very valid means of discovering the pupils who were making many errors in their writing. The tests were even less valid as a means for locating those pupils whose errors were chiefly in punctuation, or those whose errors were mainly in sentence structure, or those whose errors were chiefly grammatical. None of these correlations was above 0.55. Tests with such low coefficients of validity are in many cases the best now available and are superior to instruments of still lower validity. However, this fact illustrates the importance of developing more valid instruments as rapidly as possible.

It is probably true that many diagnostic procedures are in use whose validity has not been demonstrated. There are two kinds of evidence useful in determining the validity of an educational diagnosis. One is the demonstration of the existence of a condition known to have a causal relation to the desired objective; the other is the demonstrated effectiveness of a remedial program based directly upon the diagnosis. Thus, a diagnosis in reading that locates pupils who are suffering from astigmatism may be shown to be valid if it can be demonstrated that the pupils so selected actually fail to focus both eyes upon the same point without effort, and if it is known or can be shown that astigmatism may act as a causal factor, preventing the development of satisfactory comprehension in silent reading. Or a diagnosis in chemistry that locates pupils who fail to interpret chemical phenomena new to them in terms of known chemical principles may be shown to be valid if it can be demonstrated that a remedial program that concentrates atten-

<sup>1</sup> M. H. Willing. *Valid Diagnosis in English Composition*. (Teachers College, Bureau of Publications, Columbia University, New York, 1926.)

tion upon interpreting new chemical phenomena in terms of chemical principles does result in increased achievement on the part of the students in chemistry.

In a certain sixth-grade class in spelling,<sup>1</sup> a proof-reading test was used to discover the words that each pupil needed to study. In this class the purpose was to develop in all written work the habit of spelling correctly the common words, and the ability to recognize uncommon words that the pupil was not certain how to spell, so that he would check the spelling of these words in the dictionary. In determining the validity of the proof-reading test as a means of diagnosis, it was necessary to discover whether those who made low scores on the test made many spelling errors in their written work. When the results of the test were compared with an analysis of a large collection of pupils' written papers, the agreement in the errors was found to be 42 percent. By this check on validity it was found that the proof-reading test alone was not highly valid as a means of diagnosis for this class.

In another school<sup>2</sup> an attempt was made to use a controlled interview procedure in discovering the pupils whose poor study habits were partially responsible for difficulties in geography. Half of those pupils who were judged from the interview to have poor study habits were given intensive training in methods of study appropriate to geography, while the other half were permitted to proceed with their usual methods of study. The notable increase in geography achievement of the group given the training is one kind of evidence of the validity of the interview procedure used for diagnosis in this case.

The validity of methods of educational diagnosis has not been given adequate attention. We need to check more carefully the methods of diagnosis now in use and to exercise ingenuity in devising more valid techniques where these are needed.

### III. OBJECTIVITY

A third characteristic of a satisfactory diagnosis is its objectivity. Can other competent persons arrive at similar results when following the diagnostic procedure? Diagnosis in any field has usually been an art that goes beyond the exact techniques of a science. There will always be some persons whose shrewdness of judgment enables them to make more accurate estimates of the causal factors related to educational achievement than can others. Unfortunately, there are also per-

<sup>1</sup> Unpublished study at the University of North Carolina, Chapel Hill, N. C.

<sup>2</sup> New Hanover County Public Schools, Wilmington, N. C., 1927-28.

sons who tend to utilize intuitive judgments not based upon adequate symptoms and whose conclusions are far astray. In medicine it is usually considered desirable in important cases to have a diagnosis made independently by several competent diagnosticians unless the diagnostic procedure used is one that is almost certain to give similar results whenever any competent person uses it. The elimination of widely varying personal judgments in diagnosis is essential if diagnostic procedures are to be used with any degree of precision. Highly subjective procedures make it impossible to estimate the probable validity of an individual diagnostician's judgment until he has had considerable experience and his results have been checked. This experience is highly wasteful and injurious to the learner in those many cases in which the personal judgment of the diagnostician proves to be unsound; hence the importance of developing objective diagnostic methods.

### 1. Determining Objectivity

The simplest method of determining the objectivity of a diagnosis is to have several diagnosticians independently make a diagnosis of groups of pupils who are representative of those with whom the diagnostic procedure would ordinarily be used, and thus to see whether similar conclusions are reached independently by these various diagnosticians. These independent diagnoses may be checked for objectivity in one or both of two ways. The conclusion as to the causal factors or as to the remedial procedures needed may be recorded for each pupil and for each judge. Taking each pair of judges in turn, the percentage of agreement on the causal factors or remedial procedures for each pupil may be determined. The average of these percentages of agreement for the various pairs of individuals is one measure of objectivity.

In cases where the diagnoses are expressed in numerical terms it is possible to obtain a coefficient of objectivity by computing the coefficient of correlation between the numerical ratings for the pupils arrived at by one diagnostician and those arrived at by another. The average of these various coefficients may be used as the probable coefficient of objectivity of the diagnostic procedure.

It is not easy to express in absolute terms just what degree of objectivity is necessary for a satisfactory diagnosis. This criterion should be thought of as a standard toward which to work. An average agreement of about sixty percent between any two diagnosticians is commonly found with the diagnostic procedure now available. Cor-

respondingly, where the objectivity is measured in terms of the coefficient of correlation between the values assigned by any two competent diagnosticians, a correlation coefficient of about 0.75 is the typical average of the instruments now in use. When the agreement is as low as these averages, additional effort should be directed towards improvement of objectivity.

## 2. Improving Objectivity

Whenever a valid diagnosis is found to lack objectivity, efforts need to be directed toward the improvement of objectivity. Among the various methods helpful in improving objectivity is the use of several diagnostic procedures independently and the development of more precise and objective measurement. In discovering serious cases of introversion, for example, the observation of pupils in the classroom and on the playground by an individual teacher is not highly objective. On the other hand, the use of the Bernreuter Personality Inventory alone is not highly valid. However, when the Bernreuter Inventory is used as one source of evidence and several teachers independently for a period of time record their observations of pupils, writing down any incidents observed that might suggest introversion or extroversion, the two procedures together yield data that are quite objective. The various records combined furnish so complete a basis for inference that several psychologists independently show an average agreement of 90 percent in selecting pupils who are seriously introverted.

An illustration of the improvement of the objectivity of a diagnosis through the improvement in the objectivity of measurements is found in the development of the apparatus for analyzing the eye movements of children in reading. By the use of this apparatus, a diagnosis of the number of fixations, the length of time of the fixations, and the number of regressive movements for each pupil and for every kind of reading material can be made with a very high degree of objectivity. Additional illustrations of the improvement of objectivity of diagnosis appear in the next chapter.

## IV. RELIABILITY

A fourth characteristic of a satisfactory diagnosis is its reliability. Increase in reliability is here used to mean the decrease in the fluctuations in conclusions that can be secured by providing a more adequate and representative sample of pupil reactions upon which to base the conclusions. One question to be asked with reference to a diagnosis is this:

Do the results of the diagnosis fluctuate widely when, without change in other factors, the procedure is repeated after a short time or when the procedure is applied to other appropriate samples of pupil reactions, as when a second, but similar, form of test is given to a class?

The dangers arising from unreliable diagnoses have frequently been overlooked. It has been common in English composition, for example, to determine the grammatical errors that a pupil is likely to make by analyzing not more than two or three short themes written by him. Studies such as those by Willing indicate that conclusions drawn from the errors made on two or three compositions are often unsound. Even eight compositions do not give highly reliable results. It has been calculated that the use of this type of procedure would require about forty themes in order to have an estimate of the most serious errors of these pupils that would not change markedly by continuing to analyze additional themes. Many attempts to diagnose personality strengths and weaknesses on the part of pupils have also been highly unreliable. Teachers have attempted to rate pupils on personality traits on the basis of very limited observation. When these ratings are compared from time to time, they are often found to fluctuate widely. Conclusions drawn from one set of observations often differ markedly from those drawn from another set. Again, in arithmetic a diagnosis has been made on the basis of certain inventory tests containing only *one* exercise for each arithmetic operation or combination, whereas Brueckner and Elwell<sup>1</sup> have shown that at least three, and preferably four, examples of each type are necessary for reasonably reliable diagnosis. These are but samples of the use of unreliable diagnoses that are made in many fields.

### 1. Determining Reliability

It is obviously ridiculous to make a diagnosis so lacking in dependability that a repetition of the diagnostic procedure gives a very different result. The reliability of every diagnostic procedure needs checking. It may be determined by making two or more diagnoses with the same techniques. These several diagnoses should be so planned as to provide a comparison of the conclusions drawn from samples of pupil reactions that vary in time, and vary in the particular situation in which the reaction is obtained. For example, in determining the reliability of a diagnosis of personality strengths and weaknesses the diagnosis might be made today and again next week. Furthermore, this

<sup>1</sup> Leo J. Brueckner and Mary Elwell. "Reliability of diagnosis of error in multiplication of fractions." *Journal of Educational Research*, 26:175-185.

diagnosis might be applied to certain classroom and playground situations today and to other situations on the playground and in the classroom next week. The two sets of results may then be compared. One measure of reliability is the percentage of agreement between the conclusions drawn from the first diagnosis and those drawn from the second. Another measure of reliability is to continue these additional diagnoses until the addition of new data brings few or no significant changes in the conclusions drawn. If the diagnosis is expressed in numerical values, its reliability may be measured by correlating the numerical results from the first diagnosis with those obtained from the second. Some of the procedures in use give an agreement of no more than fifty-five percent between the results of two diagnoses or a correlation of no more than 0.70. While these values indicate a relatively low reliability, in some cases they are the best instruments now available. They are better than none and should not be discarded until more reliable procedures have been developed. This development of better instruments is urgently demanded so that diagnoses may be more dependable.

## 2. Improving Reliability

The improvement of the reliability of any diagnosis involves the utilization of a more satisfactory sample of pupil reactions as a basis for the diagnosis. Usually this means making the sample more representative of the various situations in which the kind of behavior diagnosed may be expected to express itself and increasing the number of these situations used as a basis for diagnosis.

In diagnosing students' difficulties in the techniques of the chemistry laboratory, an instructor had been depending upon his observation of the students at work on various laboratory experiments. This proved to be very unreliable. By listing the kinds of laboratory manipulation required and the types of apparatus used, he was able to develop a short series of laboratory exercises that included the use of all the kinds of apparatus and all the types of manipulation. This relatively short series of exercises could be assigned to students and their difficulties diagnosed with a reasonable degree of reliability. This procedure illustrates the improvement in reliability effected by providing a more representative sample of the kinds of students' reactions to be diagnosed.

In developing a technique for making a diagnosis of reading difficulties involved in the study of the social sciences, one of the instruments used was a test of the student's ability to apply to new problems

some of the generalizations given in a reading selection, 1000 words in length. This test was found not to be reliable enough for diagnostic use, for its reliability coefficient was only 0.60. However, by providing four reading selections of the same length, followed in each case by problems requiring the applications of generalizations given in the selection, an instrument having a reliability coefficient of 0.85 was developed.

### V. LEVEL OF DIAGNOSIS

Another important problem is to determine the level to which the diagnosis is to be carried. A diagnosis that locates only a very general area of difficulty is obviously less useful than one that defines the trouble more precisely. For a college student to know that he is making exceptionally fine progress in English and French while he is having great difficulty in chemistry is to gain information that is somewhat helpful in directing his learning activities, but this is not so valuable in directing his efforts as it would be to discover that his difficulties in chemistry lay very largely in his inability to apply chemical principles to new problems. The latter, more specific diagnosis would enable him to concentrate his attention upon a more thorough understanding of chemical principles by attempting to apply them to a wide variety of problem situations. This diagnosis might be made still more specific by locating the particular chemical principles causing trouble, such as the law of mass action or Boyle's law. Even this last diagnosis could be made more specific by determining the particular kinds of situations in connection with which the student fails to apply each principle properly.

This possibility of increasing specificity in diagnosis may be illustrated in almost any field. In the elementary schools, it may be noted that the pupil's difficulty is in arithmetic rather than in reading, language, or any of the other elementary-school subjects. The level of diagnosis may be carried still further by determining which arithmetic processes give him trouble. If this were found to be long division, the diagnosis might be made still more specific by identifying the phases of division causing the difficulty. In such a case it might be discovered that the pupil did not know how to estimate the trial divisors, although he was familiar with the various division combinations.

#### 1. Generalized Outcomes

The fact that in many cases a diagnosis may be carried to a very high degree of specificity does not imply that it is always best to make

as specific a diagnosis as possible. Certain outcomes desired in education represent generalizations of behavior rather than specific reactions. Although there may be some specific factors that cause difficulty in developing generalized behavior, nevertheless diagnosis in connection with these generalized outcomes will usually be very general in character. For example, one of the generalized outcomes desired in the field of the social studies is sensitiveness to social problems. This probably means that a pupil well trained in the social studies recognizes in a wide variety of life situations important social problems that need thoughtful consideration. New specific situations are continually arising, so that it would be impossible in the teaching to treat every specific social situation in life that the pupils are likely to encounter. Hence, this is an example of a teaching objective involving generalized behavior. In this case it is obviously inappropriate to carry a diagnosis to such a point as to attempt to discover the particular situations in which the pupil fails to recognize important social problems. A satisfactory diagnosis need be carried only to the point of identifying the *types* of situations in which the pupil fails to recognize important social problems and of discovering whether this failure is due to lack of standards for judging social desirability or inability to evaluate the situation with reference to these standards.

On the other hand, in such a subject as handwriting, there are certain outcomes that are much more specific. It is expected that the pupils in handwriting will not only acquire a rapid and tireless movement, but that they will also form each letter well enough so that it will be legible. Thus, a diagnosis in handwriting might indicate not only deficiencies in the movement, in the body, arm-and-hand position, in the way in which the pen is held, but also the particular letters that are not being properly formed. These two examples illustrate the fact that the level of specificity of a satisfactory diagnosis is partly dependent upon the generality or specificity of the educational outcomes desired in the field in which the diagnosis is being made.

## 2. Localization of Symptoms

Another factor that helps to determine the level of diagnosis is the degree to which symptoms of an educational condition can be localized. In making a physical diagnosis some symptoms can be localized to a high degree, while others are much less specific in their location. Certain physical factors, such as those involved in the control of the eyes in reading, may be localized more easily than such factors as verbal in-

telligence, reading readiness, social immaturity, and the like. In handwriting, uniformity of slant is partly dependent upon the position in which the hand is held; speed and smoothness can also be largely localized as dependent upon rather specific conditions in the grasp of the pen and the position of hand, arm, and body. For this reason, too, diagnosis in handwriting can be carried to a greater degree of specificity than can diagnosis in many other fields.

### 3. Practicability of Specific Diagnosis

A third factor in determining the level to which a diagnosis should be carried is the practicability of a specific diagnosis. The attempt to obtain a reliable diagnosis that is highly specific often increases the length of time required to make the diagnosis and increases the number of instruments used. This may result in a program of diagnosis that is so time-consuming or so expensive in personnel and in equipment as to make it impracticable for most school systems.

### 4. Specificity of Remedial Program

Finally, the decision as to the level to which to carry the diagnosis in ordinary school situations rests upon the specificity of the remedial program that is to be used as the result of diagnosis. If the diagnosis is highly specific, whereas the remedial program is much more general, the increased specificity of the diagnosis may be unnecessary. This is well illustrated by a diagnosis in physics that determines the particular kind of arithmetic and algebraic difficulties characteristic of individual students, coupled with a remedial program that consisted merely of a series of unclassified numerical exercises and problems. With such a remedial program it would be unnecessary to carry the diagnosis any further than to discover what students encountered difficulty in numerical problems. No matter what were their difficulties in working these numerical problems, all students were given the same set of numerical exercises, which were to be practiced until they had gained facility in working numerical problems in physics.

When all these factors are considered, it is perhaps enough to suggest that a satisfactory diagnosis should be as specific as the desired outcomes permit and as the possibility of localization of symptoms allow, so long as the diagnosis is practicable. It need not be carried farther than is appropriate for the remedial program provided.

## VI. COMPARABILITY

A sixth characteristic of a satisfactory diagnosis is comparability. An interpretation of the results of a diagnosis usually rests upon experience with similar data. Hence, diagnostic procedures that give comparable results are basic to intelligent interpretation. Furthermore, the progress of the pupil over a period of time is not only basic to the appraisal of the effect of remedial work, but also more symptomatic of the pupil's learning than any diagnosis made all at one time. The determination of pupil progress demands measurements that are comparable over a period of time. This requires tests that have equivalent forms or procedures so well standardized and controlled that they give comparable results when used by different competent diagnosticians and at different times.

## VII. EXACTNESS

Some diagnostic procedures give only very gross results. A certain English test, for example, measures in such large units that pupils will usually make only one point additional in their scores after a semester of instruction; in other words, the unit of measure in this test is the normal change that takes place during one semester of English instruction. This test is not precise enough to be used in discovering the progress of pupils from month to month; on the contrary, for diagnostic purposes it is very crude. Superior diagnostic procedures should enable the teacher to note progress made during smaller units of time — one week, for example. Diagnostic procedures may be tried with typical classes to discover their exactness. The exactness may be increased by analyzing the characteristics of the progress in learning more minutely and utilizing the symptoms thus identified as the bases of the diagnosis.

## VIII. COMPREHENSIVENESS

Another characteristic of a satisfactory diagnosis is its completeness, or comprehensiveness. Frequently, teachers make a very minute diagnosis in certain limited aspects of pupil activity, and no diagnosis at all in other aspects. Thus, much attention may be paid to diagnosing the words that pupils have not learned to spell correctly, and no attention to discovering the important habits and attitudes in the social studies that need further attention. Even within the limits of the same subject this incompleteness is apparent. Elaborate diagnoses have been made

of the facts that pupils have or have not memorized and no attempt has been made to diagnose their ability to use these facts in reflective thinking or to diagnose the development of desirable motives activating pupils in this subject. This incompleteness is particularly dangerous because the attention both of teacher and of learner is apt to be directed primarily towards those things for which a thorough diagnosis has been made. Pupils are thus often engrossed in the development of less important outcomes of instruction to the exclusion of more important outcomes. Remedial programs, similarly, have been provided that are largely directed towards the attainment of these less important outcomes. Justifiable criticism can be made of such a diagnostic program.

#### **IX. APPROPRIATENESS**

A diagnosis should also be appropriate. Certain desirable changes in boys and girls usually develop under a wide variety of educational environments without the necessity of giving very specific treatment. These are the changes that we consider characteristic of maturity. For such cases an educational diagnosis is unnecessary and therefore inappropriate. A diagnosis may also be inappropriate because of undesirable effects upon pupils that appear as by-products of the diagnostic procedures themselves. The procedures may sometimes bring about in pupils changes that are not in accord with the desired educational objectives. If the concomitant effects of a certain program of diagnosis are undesirable educationally, the diagnosis may do more harm than good. Hence, the diagnostic procedure itself must be considered with reference to the various effects it may produce upon children. If it utilizes a type of incentive that is socially undesirable, it may make boys and girls subject to anti-social motivation. If the procedure results in too much introspection or introversion on the part of pupils or if it has other bad psychological or emotional effects, these, too, need to be considered. Any satisfactory diagnosis must be appropriate to the program of education.

#### **X. PRACTICABILITY**

An effective diagnosis must be practicable. Can the diagnostic procedure be followed under the conditions necessary in the school? Does the procedure require no more time, personnel, and equipment than can be provided? Many of the most valid and reliable diagnostic procedures that have been developed are thought by many people

who have not used them to be impracticable for use in typical schools. Fortunately, ingenious teachers and administrators have devised ways of utilizing some of the procedures that were formerly thought to be impracticable. In addition, an important problem in diagnosis is to adapt many of the superior diagnostic procedures so as to make them more practicable.

The apparatus for recording eye movements has provided a means for making one type of careful diagnosis in reading. The device, however, is too expensive and time-consuming to make it practicable for wide use in the schools. Some of its value, however, can be realized by practicable adaptations of the procedure. A small mirror may be used to aid an observer in noting the number of fixations per line and the number of regressive movements. A watch permits the computation of the average length of a fixation. This illustrates a practicable adaptation of a technique that is impracticable in most situations.

Furthermore, new diagnostic procedures need to be developed that meet the other qualifications of a satisfactory diagnosis and that at the same time are capable of extensive use under school conditions.

#### XI. QUALIFIED DIAGNOSTICIANS

Finally, a satisfactory diagnosis usually requires educational diagnosticians who are well qualified. This does not imply that the diagnostician must be a specialist, for it is highly desirable that diagnoses be generally made by classroom teachers. However, an educational diagnosis is like a physical diagnosis in requiring that inferences be drawn from symptomatic data. This is not a mechanical procedure that can be done by anyone, without thought or judgment. The educational diagnostician, be he specialist or teacher, must understand the educational program in connection with which the diagnosis is being made. This involves comprehension of the important purposes of education, knowledge of superior educational procedures, and acquaintance with experiences that are most likely to have educational values for boys and girls. This knowledge of the educational program is necessary in order that he may avoid diagnostic procedures inimical to the educational objectives desired and that he may properly interpret symptoms of learning difficulty.

A second qualification of the educational diagnostician is knowledge of children. Too often, it has been assumed that knowledge of certain subject-matter content is adequate. Diagnosis, however, involves a study of boys and girls to discover their strengths and weaknesses in

order to facilitate their educational development. The attention of the diagnostician should be directed primarily towards the pupils. Lack of knowledge of children is an insurmountable barrier to any attempt to make a diagnostic study of pupils.

A third quality demanded in an effective educational diagnostician is the scientific attitude. This involves realization that the interpretation of the symptoms revealed in the diagnosis provides a working hypothesis. It also includes the desire to obtain evidence to determine whether this working hypothesis is sound. In addition, the scientific attitude means a willingness to change his hypothesis so as better to fit new facts that come to his attention. The tendency to hold tenaciously to tentative conclusions after they have been found unsound is an unfortunate characteristic in most of us. It is especially important for a diagnostician to recognize the tentative character of his conclusions about pupils, to check constantly the educational progress of each pupil, and to modify his conclusions in the light of this evidence.

In addition to these qualities the educational diagnostician must be able to use a variety of technical abilities. He needs to be familiar with the administration and use of various types of mental and educational tests. He needs to be skillful in the use of observations, of interviews, and of various types of case records. As teachers become diagnosticians, their need for technical skill becomes apparent. However, much available evidence indicates that the greater returns obtained by the use of methods that enable teachers to make a more careful study of individual pupils do justify the additional skills that such studies require.

## XII. SUMMARY

In summarizing this chapter, the various characteristics essential in a satisfactory diagnosis may again be briefly mentioned, since many current attempts at diagnosis have fallen far short of the expected results because some of these qualities were lacking. A satisfactory diagnosis (a) must concern itself with worthwhile objectives, (b) must provide valid evidence of strengths and weaknesses related to the objectives, (c) must be reasonably objective, so that other competent persons may arrive at similar results in following the same diagnostic procedures, (d) must be reliable, so that additional diagnoses covering other samples of pupil reactions will not give widely different results, (e) must be carried to a satisfactory level of specificity, (f) must provide comparable data, (g) must provide sufficiently exact data, (h)

must be comprehensive, (i) must be appropriate to the program of education desired, (j) must be practicable, and (k) should be conducted by persons who are well qualified as educational diagnosticians. As these characteristics are increasingly well met, we may expect educational diagnoses to yield more fruitful results.



## CHAPTER VII

### ELEMENTS OF DIAGNOSIS

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#### I. STEPS IN DIAGNOSIS

Basically, diagnosis involves two general steps. The first is measurement, or appraisal, and the second is interpretation, or inference. In fourth-grade reading, for example, any satisfactory diagnosis involves measuring or appraising the pupil's reactions under a variety of conditions related to reading effectiveness and difficulties and then the interpretation of the results of these measurements. Diagnostic procedures use, therefore, the techniques of measurement and the methods of interpretation.

'Measurement,' as the term is used in this chapter, is not synonymous with paper-and-pencil tests or with highly refined numerical units of measure. By 'measurement' I mean any evidences of significant human behavior, whether expressed in descriptive terms or in numerical values. By 'interpretation' I refer to all those inferences that must be drawn in explaining the meaning or significance of the results of the measurements. To illustrate, the teacher observes a pupil at work on column addition and notes that he often counts on his fingers. The observation of this counting on the fingers is a simple case of measurement as I am using the term. The inference that the pupil possesses an inefficient habit, which needs to be modified or eliminated, is an interpretation that the teacher might make of the results of the observation.

#### II. VARIETY IN TECHNIQUES OF MEASUREMENT

Specialization in educational research so confines our thinking that various techniques for accomplishing the same purpose are commonly thought of as belonging to different fields of investigation and are rarely utilized by the same individual. Yet many a problem is most appropriately attacked by several methods rather than by one. Especially is this true in appraisal. The techniques of objective testing are differentiated from the methods of the psychological laboratory. The observa-

tion of child behavior is considered a field distinct from mental testing. The analysis of pupil's written work is contrasted with personal interview procedures. The use of interest questionnaires is not identified with the collection of behavior anecdotes. Essentially, however, all of these techniques are methods for accomplishing the same purpose. They are all devices for appraising human behavior. By isolating each device and making it a subject of special study, we have probably improved the effectiveness of the device, but we have lost the value that comes from realizing the similarities in all of these procedures. The research worker, teacher, or school administrator confronted with the problem of appraisal is likely to think of one only of these devices and fail to recognize that the choice of the particular method of measurement should depend upon the effectiveness of that method for the particular problem under consideration. A clearer recognition of the common elements in all these methods of appraisal is needed to provide a basis for choosing the techniques to use in a particular situation.

### III. PROBLEMS INVOLVED IN EVALUATION

All methods of measuring human behavior involve four technical problems: (1) defining the behavior to be evaluated, (2) selecting the test situations, or determining the situations in which the behavior is expressed, (3) developing a record of the behavior that takes place in these situations, and (4) evaluating the behavior recorded. Regardless of the type of appraisal under consideration, whether it be the observation of children at play, the written examination, the techniques of the psychological laboratory, the questionnaire, or the personal interview, these problems are encountered. The choice of the methods of measurement rests primarily upon the effectiveness with which the methods solve these problems in the particular case under consideration.

#### 1. Defining the Behavior to be Evaluated

To define the behavior to be evaluated is essentially to determine all the kinds of behavior that are particularly significant for the purposes under consideration. The reactions of any human organism are so many and varied that it is necessary to isolate the particular reactions that are significant for a given purpose. For example, during the process of instruction in a subject, such as arithmetic, pupils are reacting in many different ways; some are talking; some are smiling; some are moving about in their seats, but these are probably not significant kinds of behavior from the standpoint of arithmetic instruc-

tion. In making an appraisal of value in the field of arithmetic it is necessary to define the kinds of behavior that are significant in arithmetic, so that we may discover whether the pupils are reacting in desirable ways. This definition would probably include behavior such as the ability to determine the total amount of an itemized grocery bill, a feeling of the importance of accurate numerical computations, the ability to determine the arithmetic processes to use in solving typical problems encountered in everyday life, and so on. Similarly, one must define social adjustment in order to evaluate the effectiveness of a child's adjustment in a social group. Many reactions are made by the child when in a social group; some of them are random and of little or no significance from the standpoint of social adjustment; others are vitally related to social adjustment. It is therefore necessary to identify the significant behavior.

a. *Including All Significant Types of Behavior.* A chief defect in defining behavior for educational evaluation has been the failure to indicate all the types that are significant in the educational development of boys and girls. We have defined the reactions involved in recalling information; we have concerned ourselves with the overt behavior in spelling and handwriting; we have characterized somewhat accurately the behavior expected of pupils in locating places on maps. Much less frequently have we defined the emotional reactions, the attitudes, and the interests of boys and girls that are of educational significance. Nevertheless, these latter kinds of behavior are fully as significant in the complete development of boys and girls as are the kinds more commonly defined for purposes of measurement.

A satisfactory definition of behavior to be evaluated will indicate all the kinds of reactions that are significant for given educational purposes. For example, in connection with the Payne Fund study of motion-picture appreciation conducted by Dale, an effort is being made to evaluate the progress children are making in appreciating motion pictures. There are many reactions significant in connection with motion-picture appreciation. We are concerned with the likes or dislikes children have for particular motion pictures, with the standards they customarily use in judging motion pictures, with the abilities they possess for applying these standards to particular motion pictures, with the sources to which they ordinarily turn for information about the motion pictures they might possibly attend, with the attitudes they have toward the importance of the motion picture as an agent for social education, and so on. It is clear that many of these types of behavior

are not ordinarily recognized when teachers or research workers embark upon a project of appraisal.

*b. Describing Significant Reactions More Exactly.* A satisfactory definition of the behavior to be evaluated will also describe each significant kind of reaction so exactly that those aspects of behavior with which we are primarily concerned in the project will be clearly understood. In the field of literature, for example, we talk a good deal about the importance of 'developing appreciation.' Before we can appraise the degree to which boys and girls are developing literary appreciation, we must describe what we mean by literary appreciation in terms of human reactions. But it is particularly difficult to describe objectively the behavior we call appreciation because our ideas of appreciation come from our own subjective feeling; that is, recognition of our own likes and dislikes leads us to speak of an appreciation or a strong liking for something. With our present ignorance of the objective reactions associated with likes and dislikes, the definition of an appreciation usually implies only that others have developed feelings of like or dislike similar to those we ourselves experience.

*c. Indicating the Range of Stimuli Likely to Bring Forth Desired Reactions.* The definition of literary appreciation (or of any other kind of behavior) should not only describe the kind of reactions to be expected but should also indicate the range of stimuli that may be expected to bring forth this reaction of appreciation or liking. It is only necessary in the definition to indicate that literary appreciation involves the development of a liking for good literature in contrast to poor literature and then to define good literature from the point of view of the persons whose behavior is to be evaluated. For high-school pupils this means that the definition should include a statement of the kinds of literature that are 'good literature' for high-school pupils.

*d. Difficulties in Defining Behavior to be Measured.* The difficulty in defining literary appreciation, as in defining other kinds of behavior, is due to these two aspects, describing the reactions that are significant and indicating the range of stimuli that may be expected to bring forth these reactions. The definition of literary appreciation is unsatisfactory to the degree that we have only a vague apprehension of the nature of the reactions that we call 'likes' and 'dislikes,' and to the degree that we fail to indicate the sorts of literature that high-school pupils may be expected to like. If our definition of literary appreciation is vague in either of these respects, our evaluation of the develop-

ment of it among high-school pupils will be correspondingly unsatisfactory.

Fortunately, the problem of characterizing the kind of behavior is not so difficult in the cases of behavior ordinarily apparent in the reactions of other people. Skill in laboratory manipulation, for instance, has made itself evident to us in the reactions of others as well as ourselves. The habit of cleanliness, the ability to read, skill in handwriting are all examples of behavior that manifests itself in other people as we come in contact with them. On the other hand, the feeling of inferiority, the satisfactions obtained from seeing good drama, the interest in investigating scientific problems, sensitiveness to human suffering, are all examples of human reactions that have become evident to us largely through our own feelings rather than through our contacts with others. As a result, these types of behavior are difficult to define except in terms of subjective feelings. However, for many purposes they are important. To make no attempt to evaluate them because of the difficulty of definition is indefensible. In most cases it is possible to define them somewhat more accurately than the usual definitions and to make at least a rough appraisal.

*e. Conditions under Which Behavior May Be Expressed.* The fact that generalization of behavior is less pronounced in some persons than in others and the additional fact that a type of behavior desirable under some conditions is undesirable under others makes it especially important to indicate in the definition the variety of conditions under which the behavior should be expected to appear. For example, we often talk about people developing intellectual curiosity. If we mean by this an interest in making investigations in any field of human endeavor, it is obvious that the evaluation of such behavior involves sampling the reactions of people under a very large variety of conditions. If, on the other hand, the teacher of chemistry wishes to discover the degree to which his pupils are developing an interest in investigating chemical problems, then the definition of this behavior should indicate that the interest in investigation is limited to the field of chemistry. Similarly, an evaluation of effective English expression requires a definition of the behavior 'effective English expression' that indicates the limiting conditions under which the behavior may be expected to exist. Generally, such a definition would indicate the types of expression that are significant in the particular case, such as social conversation, business letters, scientific reports. The purposes of these types of expressions would also need to be defined and the audiences

for whom the expression is prepared would be suggested. A complete definition of the behavior that is appropriate for a given unit of instruction in English might be one of the following: writing reports of chemical experiments for laymen in chemistry that would make clear to them the nature and the results of the experiments; writing personal letters to high-school friends that would interest the friends in one's experiences; writing business letters to a retail store that would make clear the nature of an error made by the store in connection with a recent purchase. If the behavior to be evaluated is much more general than this, the definition should make clear the generality of the conditions in which the behavior is expected to be expressed.

This critical importance of definition in connection with any evaluation of behavior has not always been recognized. It is one of the chief sources of difficulty in satisfactory measurement. As each task of appraisal is begun, the work is greatly clarified if an understandable definition of the behavior to be evaluated is formulated — a definition that includes all of the more important aspects of behavior related to the problem, that characterizes the types of reactions to be measured, and that indicates the limiting conditions under which these reactions will probably take place.

## 2. Selecting the Test Situations

The second major problem involved in all measurement is to select the situations that give opportunity for the behavior to be expressed and to be recorded for purposes of evaluation. What are the situations in which the ability to understand printed directions may be expressed and in which we may get evidence of the degree to which children possess this ability? What are the situations in which tolerance toward the ideas of other people may be expressed and in which we may get evidence of this tolerance? What are the situations in which the appreciation of good motion pictures may be expressed and in which we may get evidence of this appreciation? These are typical of the questions that must be answered in any project of appraisal.

*a. Situations That Give Direct Evidence of Significant Behavior.* From the standpoint of efficient measurement there are several characteristics to be desired in the situations chosen for evaluation. In the first place, it is necessary that these situations really give opportunity for the expression of the behavior or of reactions that are useful indices of it. Many techniques fail at this point. In the field of written examinations it is common to use, as situations for measuring the pupils'

ability to apply principles of a subject, questions that have been fully discussed in the class and that give pupils an opportunity to show their ability to recall what has been discussed rather than to apply principles to the solution of new problems. In literary appreciation it is common to present situations that give pupils an opportunity to indicate the facts they know about good literature rather than their liking for good literature. In the field of drama it is not uncommon to use situations that test the pupils' recall of the teacher's opinion of the quality of certain dramatic productions rather than their own critical evaluation of these dramatic productions. These are typical weaknesses of current attempts at appraisal. Situations chosen for purposes of evaluation should either provide an opportunity for persons to express the behavior being measured or an opportunity for persons to react in a way known to be a satisfactory index of the behavior.

Many situations do not provide directly an opportunity for persons to express the behavior being measured, though it is often assumed that they do. Thus, the type of behavior to be measured by a vocabulary test is an understanding of the meaning of a variety of words. The type of understanding required will vary with the word, but in general it means that the word, as a symbol, will stimulate in the pupil certain appropriate reactions. In the case of words used in the selection containing directions for making a radio, the words are to stimulate the student to do certain operations. In the case of words used in describing a theory, the words are to direct a development of ideas. In the case of words used in poetry, the words are to stimulate an emotional reaction. The ordinary vocabulary test, however, does not provide a means of evaluating such a range of reactions as these. The most common type of exercise in vocabulary tests requires the pupil to choose the nearest synonym for a given word from a list of four or five alternatives. It may be that this type of situation is a very satisfactory index of all the reactions expected of a pupil who has an adequate understanding of vocabulary. But I know of no convincing evidence upon this point. The validity of this multiple-response type of vocabulary test as an index of other significant reactions to vocabulary could be determined by making direct observations of pupils' reactions to the vocabulary and comparing the results of the direct observations with the scores on the multiple-response vocabulary test. If the results of the test and of the observations were similar; that is, if the pupils who showed the most satisfactory direct reactions to the vocabulary were the ones who made the highest scores on the multiple-response test, then the

multiple-response test may serve as a useful index of these reactions to vocabulary. Too often, however, we have been content to set up a simplified situation for purposes of evaluation without determining the validity of the situation. The validity can, and ought to be, checked in any dependable program of diagnosis. There are times when situations may be used that are not perfectly correlated with the direct measurements of behavior. In such cases the rough character of the index should be recognized by making due allowance in interpretation.

*b. Control of Extraneous Factors.* Another important quality of a situation used for evaluation is the degree to which extraneous factors are controlled. In written tests the vocabulary of the questions is often an extraneous factor that affects the reactions of pupils and thereby injures the effectiveness of the measurement. In the psychological laboratory, the complexity and unusual nature of the instruments may distract the attention of the subjects and thus influence the results. In the observation of children who are carrying on typical play activities, the presence of the observer may at times introduce extraneous factors that influence behavior. In the use of interest questionnaires, the desire for social approval or the lack of rapport between pupil and examiner may seriously affect the reactions. Many of these conditions can be controlled and the extraneous factors eliminated. For example, in nursery schools, rooms for observers have been so constructed that the children are not conscious of the observation. Examiners have developed simple, straightforward, and friendly procedures with children to strengthen rapport and reduce the incentive to win social approval by exaggerated statements. In connection with every problem of measurement we ought to consider carefully the methods by which we may control conditions most effectively, so that those extraneous factors which seriously affect behavior may be eliminated.

*c. Practicability.* A third quality to seek in a situation used for evaluation is its practicability from the standpoints of time, effort, and facilities required. There are cases when the observation of children at play will provide situations in which a defined type of behavior may be expressed, but those situations arise so rarely in the typical play of children as to require months of observation before any significant reactions are likely to be observed. This is obviously an impracticable technique for measuring such a type of behavior. A controlled situation in which the opportunity for the defined behavior may be offered at will is obviously much more desirable. The purpose of many testing techniques and of laboratory methods is so to control the situation that

the desired reactions will be stimulated at will and the measurement quickly made. One of the major technical problems in measurement is to control the behavior situation without introducing extraneous factors which seriously affect the reactions taking place in the situation.

The expenditure of effort and facilities is also a very real problem in appraisal. If the measurement requires expensive equipment, it is at once beyond the reach of many parents and teachers who are most in need of satisfactory techniques. If the method requires a great deal of additional effort, it is also obvious that it will not be used by a vast majority of people. Too little attention has been paid to the simplification of some of the more effective techniques of evaluation.

*d. Reliability.* A fourth quality to be desired in the situations selected for purposes of evaluation is reliability. It is necessary that these situations so sample the defined behavior that conclusions drawn from the reactions of persons in these situations are dependable. In general this means sampling the variety of conditions in which the behavior may be expressed and including a large enough number of these situations so that the behavior noted is typical of the persons whose reactions are measured. A test for ability to multiply, for example, should adequately sample the range of situations in which this behavior may be expressed—the different multiplication combinations; the different numbers of digits in the multiplier and the multiplicand; the different situations in which multiplication may be used; as for example, buying situations, the making out of a budget, and so on. The test should also sample the varying reactions of the pupil to the same situation at different times. It is clear that the provision of a reliable set of situations to be used in evaluation requires the selection of samples that include all the known variables effecting the desired behavior, and then choosing cases within the samples by some random method that is likely to include all pertinent variables not now known to effect results. The size of the sample needed should then be large enough to eliminate fluctuation from one sample to another. Thus, in testing ability to pronounce French, one might choose large samples of oral discourse that would include variations in such factors known to affect pronunciation as the various French sounds, liaison, breath groups, length of words, range of vocabulary, and so on. The particular words, sentences, and paragraphs used in the test might then be chosen from these large samples by random methods, so that if there are other factors not now known to affect the pronunciation of the pupils, these other factors have a chance of appearing in the random selections. By

using with several groups of pupils two random selections of the same size, it is possible to find out whether these selections include a large enough number of pronunciation exercises to give the desired reliability. The pupil's scores on the two selections are correlated and the resulting coefficient of correlation is the coefficient of reliability. If the coefficient is too low, the number of exercises that should be added may be estimated by use of the Spearman Prophecy Formula.

To make a wise selection of situations in which the defined behavior is to be measured requires a thorough canvassing of the possible situations, checking each of the possibilities with reference to the opportunity it provides for expression of the behavior, the degree to which extraneous factors are controlled, its practicability, and its reliability. This means cutting across the usual lines of demarcation separating written examinations, the observation of pupils, the methods of the psychological laboratory, questionnaire methods, personal interview methods. This elimination of the lines of demarcation is desirable because it is likely to provide a more complete measurement procedure than is possible where one is restricted to one particular technique.

### 3. Developing Records of Behavior

The third major problem occurring in every evaluation is that of a record of behavior. The significance of a record is due to the fact that single bits of behavior are far less meaningful and far less capable of objective evaluation than are cumulative records of behavior. No one has emphasized this fact more strongly than Dr. Ben D. Wood who developed the American Council Cumulative Record Form. The experience with this and with other forms of cumulative records clearly indicates the importance of making records in any useful program of evaluation. The possible records that might be made are varied. We may depend upon an individual's memory of the reactions that took place; we may utilize the memories of several observers; we may write a description at the time, or shortly thereafter; the behavior may itself involve the making of a record, as in the case of a written examination or the making of a product such as a dress in a clothing course; we may make motion-picture or sound records. There are in fact, a wide variety of possible records, many of which have already been utilized although they merit careful consideration in some situations.

*a. Indicating Significant Reactions.* Two characteristics are to be sought in a record of behavior. In the first place the record should indicate the significant reactions that actually took place rather than an

interpretation of these reactions. Interpretation should be deferred. The reactions that took place are objective data, largely free from the subjective interpretation of the individuals making the record, whereas the interpretations involve much more subjectivity for a single bit of behavior recorded. The behavior can be evaluated more objectively and with greater validity as the number of records increases. Many rating scales have failed to take this principle into account, with consequent fluctuations in ratings obtained by different observers and an increased difficulty in interpreting the ratings for particular purposes. Recent experimentation with the evaluation of character traits at Rochester Mechanics Institute<sup>1</sup> suggests the value of anecdotal records; that is, descriptions of actual behavior taking place in situations noted by the instructor, in contrast with rating scales that record only the interpretation of the behavior observed. For some time the faculty at Mechanics Institute had been utilizing rating scales for character traits. They found, however, that the ratings in many cases were almost meaningless, for a student might be rated high in a certain trait by half of his instructors and low in the same trait by the other half. The hypothesis was advanced that this was due to the difficulty of determining the meaning of the isolated bits of behavior coming to the attention of any individual instructor at any one time. Accordingly, the anecdotal record was devised. This was merely a description made by each instructor of any behavior he thought significant. When these anecdotal records had been collected from a number of instructors over a period of time, it was found possible to reach an interpretation that did not vary much from one competent reader to another. The interpretations, moreover, have very frequently been corroborated by later experiences.

Judged by the principle that a record should describe accurately all the significant reactions that actually took place, most rating scales, most score cards, many interest questionnaires, and many personal interviews are unsatisfactory. On the other hand, motion-picture records, sound records, many comprehensive observation check lists, many written examinations, and the collection of products resulting from behavior are much more satisfactory. In many cases it is not difficult to change the record form without changing the situation in which the behavior is expressed. In art, for example, the practice of

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<sup>1</sup> J. A. Randall and others. *Education and Research at a Mechanics Institute* (Reprint and Circular Series of the Personnel Research Federation, No. 25, 1933, p. 120.)

scoring drawings or other objects made by pupils and retaining only the score as a record may be changed to one in which samples of the objects themselves may be retained for the record, permitting later evaluations at any time.

*b. Practicability of Records.* The second quality desired in a record is practicability. Records requiring much time and effort and many facilities are obviously handicapped. The ingenuity of technicians can well be directed toward the simplification of records without sacrificing the primary requirement that they give an accurate characterization of the significant reactions which took place. Tharp's<sup>1</sup> work in the development of oral pronunciation tests in the modern foreign languages is an illustration of a successful attempt to develop a more practicable record of behavior. He experimented with a record sheet in which the student indicates the pronunciation of particular foreign words by selecting the nearest equivalents among English words listed on the sheet. He compared this record with their actual pronunciation recorded on a dictaphone and found a very close similarity between the two types of records. In the work in botany and zoölogy at Ohio State University we have developed a check list of reactions made by students while using the microscope<sup>2</sup> that may be easily checked by an observer and that gives a record closely approximating the motion-picture record of the students' behavior. The value of any comprehensive program of measurement is greatly enhanced by the maintenance of cumulative records that make interpretation more reliable.

#### 4. Evaluating the Behavior

The fourth problem encountered in all attempts at appraisal is the problem of *evaluation*. The chief difficulties in evaluation are those of determining the standards to use, of obtaining greater objectivity, of determining the scale values for different types of behavior, and of obtaining measurements in fine enough units for purposes of exact appraisal.

The standards to use in evaluating the reactions of pupils are the objectives which we are trying to reach in education. The pupil's behavior in the test situation must be judged in terms of its relative desirability from the standpoint of the values or purposes of education.

<sup>1</sup> James B. Tharp. Unpublished study, Ohio State University, Columbus, Ohio, 1934.

<sup>2</sup> Ralph W. Tyler. "A test of skill in using the microscope." *Educational Research Bulletin*, IX: Nov. 19, 1930, 493-496.

If the behavior is in harmony with the educational purposes of the school, it is given a high evaluation, if it conflicts with these purposes, a low one. Although this principle should be clear, it is too often assumed without evidence that the method adopted for marking a given test or for appraising behavior will give a satisfactory evaluation of the pupil responses in the light of the behavior being measured. For test exercises that cannot be scored by means of a key, it is not unusual to find the marks assigned by one evaluator to differ from the marks assigned by another. Obviously, they cannot both be equally valid evaluations. In such a case it becomes necessary to establish a criterion for evaluation against which any marking procedure may be checked. For reactions that must be evaluated by personal judgment the most satisfactory criterion is probably the composite evaluations of an infinitely large number of trained judges. Considering this large group as the total population in the statistical sense, it is possible to determine the number of judges needed to give evaluations as close to the total composite as desired.<sup>1</sup>

Even tests scored by means of a key ultimately depend upon personal judgment in determining the degree to which the possible responses represent the attainment or non-attainment of desired objectives. Consider a multiple-response test in which the alternative responses include both true statements and misconceptions. Pupils may check true statements, leave statements unchecked, or check misconceptions. In the light of the objective for the particular subject being tested, what is the relative value that should be assigned to these three possible responses? In certain science subjects it is the judgment of instructors that it is worse for a pupil to have a misconception than to recognize that he does not know the answer. These instructors assign the highest value to those checking the true statement, the next highest value to those leaving the exercise unchecked and the lowest value to those checking a misconception. On the other hand, I have known certain instructors in other subjects who express the belief that it is better for the pupil to try to formulate an answer, even though it is a misconception, than to make no response. These latter instructors give the highest value to those checking the true statement, the next highest value to those checking a misconception, and the lowest value to those leaving the exercise unchecked. Similarly, the results of a spelling test may be evaluated in several ways. Some teachers note only that certain

<sup>1</sup> For illustration of this method, see R. W. Tyler. "Measuring the ability to infer." *Educational Research Bulletin*, IX: November 19, 1930, 478-479.

words are misspelled. Others distinguish between words misspelled in a random manner and those misspelled in a standardized way, maintaining that a fixed habit of misspelling a word is more serious. Even a so-called 'objective test,' then, requires personal judgment in its evaluation.

To check the assumption that a given marking method gives a satisfactory evaluation of the pupil's reply, it is possible to use as the criterion of correct scoring the composite evaluation of an infinitely large group of trained judges who are guided by clear statements of the objective being measured. The results of any particular scoring method may be compared with this criterion. The variations between the particular scoring method and the criterion indicate the amount of error likely to be involved in using the particular scoring method.

A second assumption involved in the evaluation of pupil responses is that the particular numerical values assigned to the responses provide a satisfactory scale for measuring the degree to which the pupils have attained the objectives of the subject. This assumption involves a number of related problems that have not been exhaustively investigated. Some test constructors give equal weight to each exercise in the test; others weight an exercise on the basis of the relative number of persons who answer the exercise satisfactorily. Some test scores are based upon a reference point that is the mean achievement of a group of students. Others attempt to express a reference in terms of an absolute zero. Some test scores are derived from the assumption that the quality being tested is normally distributed; others are derived from the assumption of equal-appearing intervals. These instances merely illustrate the variety of methods in use.<sup>1</sup>

Projects involving appraisal, testing, or measurement are all efforts to evaluate human behavior. The kinds of human behavior significant in education are extremely varied and cannot be adequately evaluated

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<sup>1</sup> It is possible to test the validity of these various methods of assigning numerical values by establishing in each case the limits of possible error involved in these assumptions. This can be done by recalculating all the numerical values for the test responses using assumptions which are at the two greatest possible extremes from the assumptions used in the scoring of the tests. These two sets of values obtained from the extreme assumptions can each be correlated with the values originally used. This gives a means of estimating how widely different it is possible for the results of measurement to become if the assumptions upon which the numerical values have been calculated are changed. For an example of this procedure, see R. W. Tyler, "Statistical Methods for Evaluating Teacher-Training Curricula" (doctorate thesis, University of Chicago, 1927), pp. 45-52.

by any one type of techniques. All evaluation really involves four major problems; defining the behavior to be evaluated, selecting the situations, making a record, evaluating the behavior recorded. By expanding our repertoire of possible techniques of evaluation to include observations, laboratory methods, written examinations, personal interviews, and the collection of products, we shall add materially to the potential methods of evaluation in any given case. By selecting the particular techniques to use from this expanded repertoire on the basis of the effectiveness with which these methods solve the four fundamental problems of evaluation in the given case, we shall add immeasurably to the actual adequacy of our evaluations of human behavior.

#### IV. INTERPRETING THE MEASUREMENT

The making of the measurement or evaluation is not all there is to a diagnosis. The results of the evaluation must be interpreted so as to indicate the probable causal factors related to desirable achievement or difficulties in achievement. The task of interpretation involves the drawing of inferences and the forming of hypotheses or tentative conclusions. The validity of these inferences is affected by the experience of the diagnostician and by the carefulness of his thinking.

Where the measurement deals directly with desirable or undesirable educational outcomes, the results can be directly interpreted as indicating those pupils who are attaining or are failing to attain these desirable educational objectives. This interpretation is, of course, helpful, since it defines certain areas in which the students are making satisfactory accomplishments or are encountering difficulties.

When it is necessary to trace still further causal factors related to pupil accomplishment and difficulties, the problem of interpretation is more difficult. For example, in a course in botany the pupils were tested on their understanding of important botanical terms. The understanding of botanical terms is, in itself, one of the desirable outcomes of botany instruction, but the vocabulary of botany is also important, because textbooks and references usually employ botanical terminology. The discovery that John Smith, who is doing unsatisfactory work in botany, makes a low score on a test of botanical terminology, is at once significant in indicating that John may profitably concentrate his attention upon the acquisition of a satisfactory vocabulary in botany. It may also be true, but this cannot be inferred directly from the test results, that John's poor work in other aspects of botany is partly due to his lack of an adequate botany vocabulary, which prevents him from

making the best use of textbooks and references. Because a student who is low in other aspects of botany achievement is also low in his understanding of botanical terminology does not prove that the lack of botany vocabulary is a cause of his poor work in other aspects of botany. The existence of two characteristics in the same individual is not alone any evidence that one characteristic is the cause of the other. Controlled experimentation, rather than correlation, is necessary to establish causal relationship. The correlation does, however, suggest factors that may be causal and provides hypotheses that may be checked by more careful controlled experimentation.

In the case of John Smith, the fact that he does not possess an adequate botanical vocabulary suggests the possibility that this is one of the factors causing his poor work in other aspects of botany. Using this suggestion as a hypothesis, it is possible to keep the other factors relatively constant and by concentrating attention upon the improvement of John's botanical vocabulary discover whether this results in increased understanding of other aspects of botany. In diagnostic work, one may discover whether a certain condition is a causal factor by finding out whether by changing this condition while other conditions are not changed, it is possible to change the educational achievement of the pupils concerned.

The illustration of the deficiency in botanical terminology is one in which the behavior measured is a desirable outcome of instruction in itself, even if it is not a causal factor affecting achievement in other aspects of botany. Many measurements or evaluations in a program of diagnosis are made of behavior that may not in itself represent a desirable educational objective. In such cases, an interpretation must be based either upon previous experimental work or else the inferences drawn must be considered merely tentative. One useful procedure, when causal and symptomatic factors are unknown, is to compare the characteristics of those persons who are generally believed to have developed the outcomes desired with those persons who conspicuously lack the desired objectives. Thus, studies of the behavior of good readers in contrast to poor readers have revealed many symptoms of reading difficulty. In general, whenever the causal factors related to the learning desired are not known, one measures certain symptoms, infers from these symptoms the probable nature of the condition, and then infers the probable effect of this condition upon pupil achievement. Such a chain of inferential thinking is likely to be more or less subjective, so that it is important for the diagnostician to recognize that his

conclusions are only hypotheses and continually to check his remedial and preventive measures in order to determine their effectiveness. He evaluates, he interprets, he prescribes, he evaluates again to check his prescription; if necessary, he revises his interpretation and prescription and repeats the evaluation and revision, attempting to arrive at an effective procedure. In this sense educational diagnosis is highly experimental. It must be continually checked by collecting evidence of its effectiveness.



## CHAPTER VIII

### TECHNIQUES OF DIAGNOSIS

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The two expressions, preventive teaching and remedial teaching, may be applied to two different aspects of a program of instruction concerned with the improvement of the conditions under which learning takes place.

The term *preventive* may be used to refer to the definite attempts that the school may make to prevent or avert the incidence of learning difficulties, using learning in the broad sense to include growth of the whole individual physically, mentally, emotionally, and socially. The more we know about the factors that contribute to faulty or retarded learning and the better we can control their operation, the more possible it should be for the schools to arrange the learning situation in such a way that desired outcomes of learning can be practically guaranteed and the development of undesirable traits and characteristics prevented.

*Remedial teaching* may connote the methods that are used to correct various kinds of faulty behavior that develop owing to the ineffectiveness of our control and direction of the total learning situation. If preventive teaching is adequate, the need of remedial instruction should be greatly reduced. At present remedial instruction is almost unavoidable because of our ignorance of how most effectively to guide learning, because of the imperfections of our materials of instruction, and because of the uncontrolled influence of various elements of the social situation.

#### I. THE RÔLE OF THE SCHOOL IN THE EDUCATIVE PROCESS

The function of the school is to provide a carefully guided series of learning activities that will insure the achievement of those objectives of education that are accepted as valid and worth while. These objectives should not be thought of narrowly in terms of specific knowledge, skills, and abilities, but broadly so as to include attitudes, appreciations, power, purposes, and controls. These outcomes increase in variety, complexity, and richness as the child progresses through the school. At all levels they should be definitely formulated, so that all engaged

in the educative process may have a clear notion of them. To determine the efficiency of instruction as measured by pupil growth, methods of measurement must be devised that will indicate the extent to which the objectives are being achieved. At present we lack adequate tests for measuring many of the outcomes of education, such as social traits, attitudes, and interests, that we recognize as being of major importance.

To insure economical mastery of the essential tools of learning — reading, spelling, writing, and numbers — much more systematically constructed materials than those that are now ordinarily used must be provided. In the construction of these exercises careful consideration must be given to all the scientific information that is available concerning the learning process, the difficulties the learner encounters in mastering essential skills, the factors that interfere with successful learning, and the level of maturity at which the particular skills can be mastered most easily and adequately. Steps must be taken to eliminate hard spots which research has shown commonly arise in learning these skills. Efficient methods of work must be taught. Frequent diagnostic tests must be given to locate possible faults and weaknesses promptly. By using efficiently organized learning exercises, these faults should be reduced to a minimum. Steps must be taken to correct these faults as soon as they are discovered. These corrective procedures, if found effective, may later be included regularly in the materials of instruction, so that the development of similar faults in other children may be prevented. Deficiencies and weaknesses that accumulate year after year in basic skills may ultimately lead to a complete breakdown of ability to perform. Whenever the learner is to master a tool, the school is obligated to supply him with development and practice exercises so efficiently constructed that, subject to the limitations of his ability, his learning can be guaranteed in so far as the basic skills are concerned.

It thus appears that the school can quite definitely control the activities of the pupil involved in learning specific skills, such as reading, writing, computing, spelling, punctuating, and the like. These skills can be learned with a relatively high degree of efficiency and with much greater ease than was formerly the case because of the scientifically constructed instructional materials now available, although it must be admitted that there is a great lag between much of current instructional practice and the application of the findings of experimental studies of effective teaching procedures.

The degree to which the school can be expected to assume the responsibility for character traits, attitudes, appreciations, and similar

less specific outcomes of education is to a large extent determined by the degree to which the school can control the influences in the environment that contribute to their development. The school of pioneer days was little concerned with these social outcomes; they were left to the home, the church, the social group, and other outside agencies. Because of the breakdown of the control of the modern home, the decrease in the extent to which the church assumes responsibility for ethical training, and the many unwholesome influences in present-day social life, the school has been gradually assuming many of the functions of those institutions. By methods that are rapidly being developed, the school can diagnose some types of deficiency in the personalities of the children, but because of the many uncontrollable factors that contribute to these undesirable traits, the school finds it extremely difficult to bring about distinct improvement in them. This complex problem presents some of the most serious difficulties that the school faces in achieving its objectives. The task of guiding a major portion of the learning activities of children in a complex social order is the recognized function of the school and the obligation cannot be shifted or neglected. It is to be hoped that as much progress will be made in the development of efficient instructional procedures, diagnostic techniques, and corrective methods in our dealing with social traits as has been made in the improvement of instruction dealing with the more specific skills involved in the tools of learning. At the same time the school must assume leadership in the attack that must be made to improve the quality of forces of the environment that play such an important part in the development of the total personality of the learner.

## II. INDIVIDUAL AND TRAIT DIFFERENCES

The physiological mechanism which is involved in learning consists of a complex organization of muscles and neurones. We know little about how this mechanism operates. We know from his responses and behavior that the individual learns, but we have no way of discovering directly how the mechanism is modified by learning experiences. This physiological mechanism may for various reasons be imperfect in its functioning. Some of its elements may be defective. The mechanism itself is acted upon by environmental forces of many kinds. The individual is the resultant of the interaction of nature — the inner constitution of the individual — and environmental circumstances. Since these two factors are never the same for two individuals, it is obvious that individuals will differ in the quality and richness of their ideas, the

number of connections to be drawn on in attacking novel problems, the correctness of the meanings and beliefs relative to social, economic, and political affairs, the complexity and difficulty of ideas they can grasp, and similar traits that differentiate the levels of intellect and culture among individuals.

Associated with this biological mechanism is "the ability to connect and keep together what ideas have gone together and to form those connections which have been immediately satisfying." When faulty connections exist, or when connections are dislocated into wrong relations, errors in thinking result.

The experimental study of individual differences has revealed a number of facts concerning the ability of children to learn that are of fundamental importance in the field of diagnosis.

1. In any realm of activity we find a wide range in the endowment of individuals. This is true for mental ability, mechanical ability, artistic talent, reading ability, and all other native and acquired traits. The general tendency in any given type of activity is for the ability of most individuals to cluster about a central point. However, individuals range far above and below this middle level. The farther one ranges from the middle level, the smaller is the number of individuals, until limits are reached beyond which there are none; that is, for any given trait the distribution of aptitude approximates the normal curve of distribution. This range of aptitude is continuous; that is, there are no gaps in the curve of the distribution of talent. This means that individuals cannot be sharply classified into specific types, such as intelligent or feeble-minded, mechanical or intellectual, and so on: the various levels merge gradually and are not clearly differentiated.

2. Just as individuals differ in the extent to which they possess a single trait, so each person varies in the degree to which he possesses various traits; that is, native endowment is not symmetrical. For example, some individuals of relatively inferior mental ability have unusual power in specialized traits, such as ability in mental computation; they have remarkable memories, or distinct talents in artistic lines, although in other respects their level of aptitude is much below normal. This variation in abilities is also found when the results of achievement tests of normal children are analyzed; that is, pupils do not as a rule rate at the same level on various achievement tests. The wider the range of traits tested, the greater appears to be the range of aptitudes. Some individuals are much more variable than others. However, it seems to be true that the distribution of talent for one individual over a wide

variety of traits follows the normal law that describes the distribution of talent among individuals for a single trait. This important fact is of great significance in educational guidance, and it is evident that a definite effort must be made to discover both the special aptitudes and the weak points in the individual.

3. In general there is a high degree of correlation between the aptitudes of individuals in highly complex intellectual activities, such as reading and problem-solving, or performance on intelligence tests and examination marks. The less complex the activities and the more specific the skills or abilities tested, the lower is the correlation; for example, the correlations between different measures of mechanical ability are low. Performance on relatively simple motor tasks, such as speed of oral counting and speed of writing, correlate with each other very slightly. These facts clearly reveal the necessity for much more analytical diagnostic devices than our general survey tests provide. Thorndike has suggested that, instead of a single index of general intelligence, it may be desirable to analyze intellect into at least three phases—intellectual, social, and mechanical. The uniqueness of these various aspects of intellect was recently revealed by an investigation that led to the development of a battery of tests of mechanical ability which correlated only 0.28 with general intelligence.<sup>1</sup> It has been repeatedly demonstrated that individual profiles of complex abilities, such as reading or arithmetic, based on the results of a series of tests, each of which measures a relatively narrow aspect of the general ability, are decidedly uneven in outline, indicating that the various skills have not been developed to the same level (assuming, of course, that the tests are valid measures of ability). This unevenness of profiles is characteristic of both bright and dull children. As the result of a painstaking study of this problem, Brown<sup>2</sup> arrived at the following conclusion:

The only conclusions which it seems possible to arrive at logically are that dull boys and bright boys show an equal amount of unevenness in all the abilities considered here, that the abilities of one group are as highly specialized or differentiated as the abilities of another, and that as far as this specialization is a determining factor, the two groups should have the same type of class organization and treat-

<sup>1</sup> D. G. Paterson and others. *Minnesota Mechanical Ability Tests* (Minneapolis: University of Minnesota Press, 1930).

<sup>2</sup> Andrew Wilson Brown. *Unevenness of the Abilities of Dull and of Bright Children* (Contributions to Education, Teachers College, Columbia University, New York), p. 109.

ment. Each boy of each group should be considered as a unique individual who needs individual educational and vocational guidance.

If, therefore, a pupil scores high in a test that measures only a relatively narrow skill or aspect of ability, it cannot be assumed that his performance on rate of reading or comprehension is a valid index of his attitude toward reading, the quality of his free reading, his ability to remember what he reads, and other important elements in his reading. Analytical tests of these elements must be used to discover possible shortcomings. It is likewise true that a high score on a test of general ability does not give a reliable indication as to the relative status of the pupil's control of the many specific skills of which the general ability consists.

4. It has been repeatedly demonstrated that, under normal conditions, general as well as specific traits are readily affected by training. For example, a third-grade child who scores low on a test in addition will under ordinary conditions improve rapidly with practice on the elements involved. Similarly, exercises stressing speed of reading usually result in marked growth in rate of reading. The teacher who is aware of the value of intensive practice on specific skills and narrow abilities can arrange systematic practice to correct some of the deficiencies in skills that are revealed by analytical tests. In case the pupil does not readily respond to this treatment, the teacher may suspect the presence of factors that interfere with successful learning. Definite steps should then be undertaken to diagnose the nature of these factors and the specific ways in which they operate. To eliminate the deficiencies, appropriate corrective and remedial work should follow.

5. Some deficiencies, such as inferior mentality, muscular incoördination due to disease or injury, and the like, cannot be corrected by any known means; other deficiencies, such as alexia or dyslexia, can be alleviated or corrected only by very careful corrective measures and the use of specialized apparatus; still other deficiencies, such as faulty vision, malnutrition, glandular malfunctioning, and the like, can in most cases be readily corrected by appropriate hygienic measures; some faults often regarded by adults as serious, such as lip movement in reading in primary-grade children, or counting in adding numbers, usually disappear with the passing of time and growth in control of the basic skills involved, indicating that the deficiency is of a purely temporary kind. The problem of correcting character traits, attitudes, beliefs, and the like, presents much greater difficulty. There is available very little

definite information concerning the specific methods that may be used to bring about desired changes in the personality, for example, of an individual with marked anti-social tendencies. A glaring example of the result of this lack of authentic information scientifically established as to the effectiveness of particular corrective measures is the hit-or-miss procedure followed by many of our social institutions that deal with delinquents. The basis of our methods of dealing with such problems is no more scientific and dependable than the body of beliefs, superstitions, and incantations that guided the medicine man in his efforts to cure disease.

6. Maturity appears to be a marked factor in the growth of the individual. As children grow older, their rate of performance in general increases; they learn more difficult tasks; the quality of their performance, for example, in writing, improves. Gradually their methods of responding tend to approximate those used by mature individuals; for example, the procedures used by young children in column addition gradually change from a highly inefficient performance to one that approximates that used by adults. What the individual learns modifies his behavior in subsequent experiences. Children differ widely in their ability to profit by experience. Even if they are of the same general level of intelligence, they do not profit equally from the same experience, owing to differences in background, appreciation of the significance of the activity, and the like. In our present curriculum many children do not succeed because the tasks assigned them are too difficult; others are given tasks entirely too simple to demand their best efforts. In some communities children have relatively meager, often unwholesome experiences. The narrower their range of experience, the narrower is the range of their possible reactions to new situations. The school's function is so to organize the learning activities of those entrusted to its care that their lives may be enriched and broadened. Just as children differ in their rates of growth in height, weight, and other physical characteristics, they differ in their rates of mental growth, the rates at which they learn to read, spell, and compute. These differences in rates of growth are probably due to differences in inborn, original nature, or capacity, which may be assumed to be fixed by heredity. Physical changes appear to take place as a result of fundamental life processes that appear to be beyond our control.

It is recognized that the character of the general growth curve for learning approximates the curves for physical development.

TABLE I. SCORES IN READING OF THREE MENTAL-AGE GROUPS

Mental Age	(Secured from nine forms of the Thorndike-McCall Reading Test)								
	Form 1	2	3	4	5	6	7	8	9
8	99	105	111	116	124	125	123	119	121
10	125	125	126	128	135	137	134	131	132
12	141	141	141	145	147	149	146	148	150

Table I contains data on the growth of reading ability of a typical group of children of three mental-age levels as measured by the Thorndike-McCall Reading Test. The nine forms of the test were given at intervals of approximately four weeks; the total time elapsing was equivalent to a school year of nine months. It will be observed that for each mental-age level there is a gradual growth in reading ability during the first six months. Just as children grow in height, weight, and other physical characteristics, they grow in reading ability.

There are marked deviations from the normal curve of growth for individual children. Some of them show steady growth throughout the year, while others in some years improve very little. Some pupils grow in ability for a time, then stop, while the ability of others apparently retrogresses steadily for a period. To insure optimal growth of each child, it is vital that the factors that cause these variations be determined, so that they may be controlled and intelligent adjustments may be made.

7. Growth of the individual is determined by observing in more or less precise ways the changes in his behavior and reactions and making inferences from these symptoms. The pupil makes responses to various types of stimuli. If these responses indicate that correct connections have been established, we say that the pupil has learned. Each specific act of behavior is conditioned by many types of mechanisms. For example, the performance of a second-grade child on a rate test to determine his knowledge of addition combinations is a complex of his ability to write numbers, his ability to recall the sums he is to write, his emotions while taking the test, his reactions to the directions given, the effort he makes, and his ability to concentrate on the task at hand. Some of these conditions may be varied at will by the examiner; others are beyond his control. Variations in one or more of these factors, such as effort put forth, will cause a pupil's performance to fluctuate, although the basic ability involved in the performance remains constant. This fluctuation in performance makes it difficult to determine the individual's true ability. Ability cannot be accurately inferred from perform-

ance on a single test of even the simplest trait, such as knowledge of addition combinations. When the skill is tested under varying conditions, the scores usually vary much more widely, for example, the score when the pupil is given as much time as he needs usually differs markedly from that when he works under time pressure. A single test apparently measures behavior under the conditions of the test only.

The question naturally arises: How can one get a satisfactory index of a pupil's general ability, say, in addition of whole numbers? Should it be based on his best performance on a series of tests given under varied conditions? Should it be his poorest performance? Should it be his median or mean performance? Courtis<sup>1</sup> considers median performance in any series of performances involving the skill being evaluated as the best measure of ability.

Much research must be done to develop more valid means of measuring growth of the individual in his intellectual, emotional, social, and moral traits, since the conditions under which these traits can be measured are exceedingly difficult to control. The reactions of a single pupil, for example, to a particular musical selection vary from time to time and there is no general standard for evaluating them. Appreciations cannot be measured directly; they must be inferred from behavior that may or may not be a true expression of the reaction of the learner.

8. So far as is feasible, instructional practices must make provision for individual differences. In general, all pupils should have the same basic social experiences. Since children differ so greatly in their ability to learn, the requirements of particular experiences should be adjusted to the varying capacities of the group. Knowledge of the potentialities of normal groups makes it possible to adapt instruction intelligently to individuals who deviate from the group. All practice work intended for the purpose of developing skills should be individualized, so that each pupil may progress at his own rate. Children differ so widely in their interests, their experimental background, their mental capacity, their physical development, and similar characteristics that adequate provision should also be made for these variations in all types of learning activities. Since children differ so widely in the degree to which they possess various aspects of intellect, each one must practically be dealt with as a unique personality, unlike other members of his group in the pattern of his specific traits.

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<sup>1</sup> S. A. Courtis. *Why Children Succeed*, p. 48.

### III. DIAGNOSIS OF PHYSICAL, MENTAL, AND SOCIAL STATUS

Because of the close relation between the physiological mechanism and learning, the school should have available information as to the physical status of all pupils, based on systematic, periodic examinations by persons thoroughly familiar with the relationship between these factors and learning. The functions of a school health service are to give assurance that the child is fit for the routine to be imposed upon him, and to find defects and correct them. Behavior that deviates significantly from the normal must be noted early. The health service should be supplemented by a guidance service concerned with the mental, emotional, and social behavior of the pupils, because of the importance of considering physiological and psychological factors that underlie mental health and social adjustment. A comprehensive behavior diagnosis should be descriptive and analytical, and the evaluation of behavior should be based on systematic formulations of normative characteristics. The accumulation of such data based on a series of examinations makes it possible to determine the growth characteristics of the individual. Medical, clinical, and public-health provisions constitute the basic safeguards of the child's mental and physical development.

It is beyond the scope of the present chapter to discuss in detail methods of diagnosis of the child's physical, mental, and social status. These techniques are discussed more fully in other chapters. The teacher must recognize the close relation between learning and the physiological mechanism and should in all problem cases determine the extent to which physical as well as mental and social factors may underlie the difficulty.

### IV. THE FUNCTIONS OF EDUCATIONAL ACHIEVEMENT TESTS IN DIAGNOSIS

To measure and evaluate the status of behavior, aptitudes, and other traits, many measuring devices have been constructed. These include intelligence tests, general survey tests, tests for measuring achievement in the several school subjects, analytical tests which measure ability in a number of the more specific elements of which such a general activity as reading is composed, aptitude and prognostic tests for predicting future success in particular lines of endeavor, mechanical ability tests, trade tests, character tests, tests of open-mindedness, tests

to measure the effectiveness of learning procedures, quality scales for measuring the merit of a performance, and many others.

This wide variety of tests attests the necessity of dealing with all phases of the personality of the individual. The value of measurement as a means of enabling the learner to evaluate his experiences and to direct more efficiently the subsequent stream of his experiences is being clearly recognized. Increasingly it is becoming evident that education must be guided by a clear-cut underlying philosophy emphasizing the growth of the learner as a well-rounded personality. The methods and materials of instruction must be selected on the basis of a well-formulated body of specific objectives. Tests to determine the degree to which these objectives are being achieved must be constructed if they are not already available.

When the results of general tests show that some objective of instruction is not being achieved, systematic methods of determining the reasons for the unsatisfactory outcome must be undertaken. One essential tool of such a procedure is the detailed diagnostic test by means of which the specific element that is at the root of the difficulty may be discovered. Considerable progress has been made in developing diagnostic tests of this type for such skills as those involved in arithmetic, reading, and some phases of English. As already said, diagnostic tests for locating the precise nature and degree of deficiencies in such important outcomes of education as social traits, attitudes, and appreciations are almost wholly lacking.

#### V. ANALYZING CHARACTERISTICS OF THE LEARNER'S PERFORMANCE NOT READILY EVALUATED BY MEASUREMENT

Standardized tests provide a valuable means of measuring the ability of learners in so far as their rate of work, the difficulty of the tasks they can perform, and the area or range of their intellect are concerned. They also determine approximately the level of the pupil's performance in many specific skills. Their scores, however, give no precise information concerning the efficiency of the pupils' methods of work or the nature of the difficulties contributing to an inferior performance. Many clues to these difficulties may be discovered by analyzing the errors the pupils make or by discovering faulty methods of work they employ both on tests and during the ordinary class work. Obviously there may be many pupils whose scores indicate an ability average for their age or grade, but who may be doing work below their potential performance if they used more efficient methods of work. A child's

rate of reading may be low because he reads one word at a time instead of groups of words; his rate of work on an addition test may be low because he counts to get the answer; his answers to questions may reveal many erroneous ideas; errors may be due to faulty procedures, round-about methods of work, and the like. When these faulty methods of work are discovered and corrected, improvement in test scores usually results. These faulty methods of work may be suspected because of inferior performance on a test; however, supplementary diagnostic techniques of a more penetrating kind are needed to locate and analyze them.

The methods that enable the teacher to make a diagnosis of the quality of the pupil's performance and to analyze the elements of faulty responses in learning situations may be grouped under six heads: (1) observation of the pupil at work on ordinary daily assignments or in standard situations, (2) systematic analysis of various characteristics of the pupil's written work, (3) systematic analysis of the pupil's oral responses and reactions, (4) the use of objective, analytical diagnostic devices to determine by comparative methods precisely and in detail the faults the work of the pupil exhibits, (5) the interview, either with the pupil, his family, or others of his social group, to locate contributory conditions, (6) laboratory procedures.

### **1. Observation of the Pupil's Study Habits, Attitude, and Reactions**

*a.* While the pupil is at work, the teacher may attempt to discover manifestations of lack of control of basic skills. Counting in arithmetic processes by tapping with the pencil, with finger, with the feet, and in other ways can readily be detected. Many pupils in Grades III to V have difficulty in adding long columns of numbers, owing to inability to proceed when the break in attention comes before the column has been completed. This fault can easily be detected by the extent to which pupils repeat partially completed work. The extent of vocalization in silent reading and the presence of excessive lip movement, easily determined by observation, indicate lack of control of important skills in silent reading. By observing the pupil's eye movements while reading silently, an analysis of their characteristics may be made that may be of value in diagnosing reading difficulty. Handwriting may be poor because of faulty placement of the writing paper or faulty holding of the pen, readily detected by observation, especially noticeable in the performance of left-handed pupils.

b. Some pupils have such slow reaction time and write so slowly that their scores on rate tests should not be compared with those of more rapid writers until allowance has been made for the differences in their rates of work. The teacher should note to what extent the rate of motor response seems to be associated with apparently inferior performance. This is especially necessary in the lower grades, where lack of control of the mechanics of writing greatly reduces the efficiency of work on rate tests.

c. The pupils' study habits may be observed and analyzed. McCalister, for example, analyzed the study habits of pupils in classes in reading and social studies. As a result of this survey, supplemented by interviews to check the results of his observations, he assembled a list of faulty study habits used by pupils that can be used as a guide in the observation of pupils at work. Some pupils apparently have systematic business-like work habits, while others obviously have very inefficient methods of work. The teacher can make this analysis most effectively if she limits the observation to pupils whose work according to test scores is not satisfactory. The analysis may be even further limited by observing the extent to which the pupils are using standard methods of work being taught in such subjects as spelling, or by observing the efficiency with which they carry out easily observable pieces of work requiring the use of specific skills, such as an assignment involving the locating of certain topics in reference books by means of the reader's guide.

d. The attitude of the learner toward his school work should be given careful consideration. A negative, uncooperative, indifferent attitude is clearly not conducive to learning. Such an attitude may be the result of different factors, such as undue difficulty of the work, failure of the teacher to make the subject appeal to the learner as intrinsically worth while, faulty attitude of the home toward the school, or possibly an undesirable type of personal relationship between the pupil and the teacher or between him and his classmates.

e. The teacher may analyze the kind and extent of participation of a pupil in class activities, using as the basis of analysis a list of the types of pupil activity that are desirable or some such general standard rating chart as the Haggerty-Wickman-Olson Behavior Rating Scale. Numerous blunders and failures obviously point to lack of understanding of the class work. Horn has shown that in the average classroom pupils of inferior ability participate much less in class activities than do pupils of average or greater ability. Failure to participate at

all may be regarded as clearly symptomatic of difficulty to grasp the subject, lack of interest, or emotional maladjustment of some kind. In some schools attempts have been made to list the desirable types of responses and action the school should seek to develop and the unwholesome behavior patterns that should be checked and corrected. A systematic scrutiny of the ways in which pupils participate in class work on the basis of such a check list may reveal to the teacher many weaknesses that would otherwise be overlooked.

*f.* The teacher may note the reactions of individual pupils to various kinds of incentives and methods of motivation. While the experimental evidence that is available shows clearly that classes respond more to praise of good work than to punishment or reproof, it seems likely that not all individuals react in the same way to a given motivation. Some pupils make excellent scores on important tests, yet, owing to indifference or lack of interest, make relatively little effort to carry out the daily assignments. It is important that the school consider the values of motives used to stimulate learning. In general, intrinsic are more vital than extrinsic motives.

*g.* The teacher should make a definite effort to discover the special interests and aptitudes of the pupils, as revealed by their activities both in and out of school. In some schools this is made possible by providing 'free' periods during which pupils are encouraged to undertake activities that especially appeal to them or by providing opportunities for pupils to investigate topics of special interest in connection with their regular courses. Many unsuspected talents have been revealed in such classes. Of course, such special talents and abilities may be revealed in practically any phase of school work.

## 2. Analysis of the Pupil's Written Work

*a.* The analysis of the written work of pupils often reveals the nature of the apparently unsatisfactory performance. Because of the greater possibility of controlling the aspects of performance to be analyzed, it is desirable that the examiner use standardized exercises constructed in such a way that serious difficulties known to exist in the work of pupils will be made evident. Many deficiencies will also be revealed by the analysis of the written work done from day to day on ordinary assignments. In the case of tests, the pupil may have misunderstood the nature of the test and not followed directions; the format of the test may have confused the pupil; the pupil may have been markedly deficient in only one phase of the test and not have a general disability;

there may have been a single, persistent type of error in all of his work that could be discovered by analysis, but that would not become evident if his test score alone were considered. The analysis of a written performance may also reveal a wide variety of errors changing from item to item, thus making it difficult to arrive at a reliable diagnosis. In all these cases test scores alone do not reveal the essential faults.

b. To determine the exact nature of the fault or weakness involved, it is necessary in some cases to make extensive, detailed analyses of the various kinds of errors found on test papers. Lists of the faults found in the written work of pupils are available in spelling, arithmetic, composition, and writing. Some of these faults are symptoms of serious deficiencies; others are of minor significance. Carroll<sup>1</sup> found, for example, that the spelling errors of bright children indicated a clear tendency to apply to the spelling of unfamiliar words generalizations based on ways of spelling similar sounds in known words. On the other hand, pupils of inferior ability did not show this ability to generalize. Random, unintelligible misspelling of words is therefore a much more serious fault than mere phonetic misspelling. The fact that a pupil makes a particular kind of error in a particular arithmetic example or uses some faulty procedure is no assurance that the same type of error will be found in other examples of the same kind or on successive trials of the same example. Brueckner and Elwell<sup>2</sup> have shown that errors in multiplication of fractions are much less persistent than has ordinarily been believed. To determine the cruciality of error in arithmetic, the persistence of error must be discovered. In some cases persistent difficulties can easily be corrected; in others they may be extremely difficult to overcome. A tendency to errors in reading due to reversals is a much more critical symptom than mere repetition of words or simple mispronunciations, because of the probability that in reversals a fundamental physiological condition difficult to correct may be involved. Much needs to be done to determine crucial faults affecting learning and methods of detecting them. It is almost certain that many serious disabilities are as yet unidentified.

c. Written compositions of pupils may be analyzed to determine the qualities that affect their merit. It is much more difficult to do this

<sup>1</sup> H. Carroll. *Generalization in Bright and Dull Children*. (Teachers College Contribution to Education. New York: Bureau of Publications, Columbia University.)

<sup>2</sup> L. J. Brueckner and M. Elwell. "The reliability of diagnosis in multiplication of fractions." *Journal of Educational Research*, 26: November, 1932, 175-185.

accurately than to analyze the mechanical errors made. For example, written compositions may be analyzed from the point of view of the richness of the vocabulary, the freedom from errors of structure, the originality and freshness of the style, and similar characteristics. The variations in quality and general merit from composition to composition make it exceedingly difficult to arrive at a reliable diagnosis.

*d.* Some investigators have found it helpful to get from students written statements in which the students attempt to describe in detail their study habits, their methods of learning to spell words, their methods of memorizing, and other characteristics of their learning procedures. From such statements lists of faults have been compiled that give valuable hints as to the unsatisfactory work habits pupils employ. In several investigations questionnaires based on check sheets listing both good and bad study habits have been administered to pupils of high and low ratings to discover if possible the differences between the habits of the two groups. This plan has not as yet proved wholly satisfactory; it does, however, contain the germ of what may prove to be a very helpful diagnostic device.

### 3. Analysis of the Oral Responses and Reactions of the Learner

*a.* In order to diagnose the types of errors in oral English made by pupils in their school work, a record of such errors can be kept by the teacher. If this record is kept for a long enough time, persistent faults will be revealed. It must be remembered that this list gives no adequate picture of the kinds of errors pupils make in life outside the school. Similar records should therefore be compiled on the playground, in free activity periods, in group study, and at other times when the habitual responses of pupils are likely to be made more freely than in the classroom.

*b.* A systematic analysis of the errors made by the pupil in oral reading will often reveal persistent faults and sources of difficulty in so far as ability to pronounce words is concerned. Lists of the kinds of errors and undesirable types of responses that pupils make in oral reading prepared by Gray, Monroe,<sup>1</sup> and others are very helpful in this connection. Crucial faults, such as reversals, faulty return sweep, gross mispronunciation, and failure to group words meaningfully can readily be detected by having the pupil read aloud.

*c.* The responses of pupils in the lower grades while reading stand-

<sup>1</sup> Marion Monroe. *Children Who Cannot Read* (Chicago: University of Chicago Press).

ard lists of words aloud under time pressure often reveal marked deficiencies. Some pupils seriously lacking in ability to recognize words substitute other words almost at random for those included in the test; some give words that are correct except for the initial or final sounds; some substitute words spelled in similar ways, such as 'live' for 'love'; some sound each phonogram very carefully and slowly, but are often unable to blend them; some can read only the easiest words, showing a marked limitation in the range of their reading vocabulary. Durrell has worked out a very helpful device<sup>1</sup> for determining the degree to which the pupil uses the whole method or the analytical method in reading words. To test for the whole method, the pupil is required to pronounce a carefully selected group of words that are exposed in succession for only an instant. Durrell believes that ability to pronounce the list of words correctly with short exposures indicates reading by the whole method, that is, recognizing words as wholes. The greater the range of the pupil's vocabulary of words instantly recognized, the less time he must spend in analyzing words; consequently his reading efficiency is increased. Pupils who make low scores on this test are then allowed to read the same list of words without time limits to determine the degree to which they can work out the pronunciation of the words by analytical methods. Durrell shows that many pupils who can pronounce only a few of the words correctly when they are exposed for only a short period of time can pronounce many of the words correctly when given time to analyze them. The analytical method of word recognition results in reduced speed of reading, failure to group words into associated units, inefficient eye movements, and similar types of behavior reducing the efficiency of reading. If the faults revealed by such exercises are also present when the pupil is required to read sentences, paragraphs, or stories under time pressure, it is obvious that he can comprehend little of what he reads.

d. Courtis<sup>2</sup> has devised a method of diagnosis in arithmetic that involves the analysis of oral statements of procedure. In working an example, the pupil is required to give aloud the mental steps by which he arrives at the solution. The examiner observes these responses and determines in what ways they are faulty. Buswell and John have supplied us with an analysis of the variety of unsatisfactory responses and methods of work that were used by a large group of pupils slow in

<sup>1</sup> Unpublished.

<sup>2</sup> S. A. Courtis. *Manual of the Courtis Standard Practice Tests in Arithmetic* (Yonkers: World Book Company).

arithmetic. Their method of diagnosis, based on an analysis of oral responses, is more accurate than the scrutiny of written work, since in the latter case subjective inferences that may be incorrect as to difficulties must constantly be made. The method of analysis of oral responses can, if necessary, be made wholly objective through the actual recording of the complete statements of the learner. On the other hand, the question may be raised, "How certain can we be that the oral statements of the pupil are in fact the procedures he uses when he does the work silently?" Introspection is a very difficult process, even for trained observers.

e. Because of the harmful influence of slovenly, faulty speech habits in spelling and reading, the teacher should make a systematic appraisal of speech difficulties of the pupils. In their extreme form, these faults are called stammering and stuttering; in their minor forms, they are evident in lisping, incorrect sounds, mispronunciation, and indistinct speech. Many of these weaknesses can be corrected by the proper kinds of remedial exercises. In all cases in which there is marked speech difficulty, the specialist should be asked to make a diagnosis.

f. In such subjects as spelling, arithmetic, and handwriting, self-diagnosis by the pupil is very helpful. The pupil should be encouraged to indicate to the teacher points that are causing him difficulty; for example, the hard spots in words to be spelled, the parts of an arithmetic process that he does not understand, the faults his handwriting exhibits. The teacher's efforts should be directed toward helping the pupil to make such an analysis of his deficiencies by providing suitable diagnostic devices, by requiring the pupil to give his analysis orally, by giving suggestions as to how to proceed in making a self-diagnosis, and by suggesting helpful corrective exercises.

#### 4. Objective Devices to Determine the Nature and Significance of Faults

a. A series of analytical diagnostic charts containing illustrations of faults affords an excellent basis of diagnosis. Freeman<sup>1</sup> and Nystrom<sup>2</sup> have developed two such series on handwriting. By means of these diagnostic charts it is possible to determine the factors that contribute to illegibility. Remedial steps can then be intelligently planned. Simi-

<sup>1</sup> F. W. Freeman. *Chart for Diagnosing Faults in Handwriting* (Boston: Houghton Mifflin).

<sup>2</sup> E. Nystrom. *Self-Corrective Handwriting Charts* (Minneapolis: Farnham Press).

lar diagnostic charts have also been devised for drawing and composition. These types of diagnostic exercises are especially valuable because they not only make it possible for the pupil with a little training to diagnose his own difficulties and faults, but also make clear to him the type of responses he should try to check or avoid and those he should try to develop.

b. An analysis of the pupil's rate of progress on standard practice exercises in arithmetic, writing, reading, and other subjects serves as a very convenient basis of diagnosis. Failure of the pupil's performance on a particular exercise to improve with practice is an almost certain indication of difficulty of some sort. This analysis of progress is facilitated by using a continuing graph showing results from day to day. In some cases these graphs show an actual falling off in daily scores, an almost certain indication that serious difficulty is present.

c. There are available standard scales of descriptions of pupils' methods of study, by which the observer can rate the behavior of the pupil. Woody's scale<sup>1</sup> for evaluating reading habits is an illustration. An analysis of that description on the scale which most nearly describes the reactions of a particular pupil reveals the types of behavior while studying regarded by psychologists as undesirable or worth while, as the case may be. Wrenn<sup>2</sup> has published an excellent device for evaluating the study habits of high-school and college students.

d. In order to get a graphic picture of the degree to which the pupil is actively at attention in the recitation or study period, Morrison<sup>3</sup> has devised the individual attention profile. By means of this device an observer can keep a continuous graphic record of the apparent attention or lack of attention of the pupil at work in the classroom. To assist in the evaluation of this record, a systematic account of his behavior paralleling the chart may be kept.

e. In some cases a record of the ways in which the pupil spends the time devoted to school work and to out-of-school activities reveals valuable information for diagnostic purposes. Despite the inaccuracy in some of these reports prepared by pupils, facts of real value can be secured if the learner will coöperate. The value lies in the fact that the data are quantitative. Moreover, it is often possible for the examiner

<sup>1</sup> Unpublished.

<sup>2</sup> U. G. Wrenn. *Study Habits Inventory* (Palo Alto: Stanford University Press).

<sup>3</sup> H. L. Morrison. *Practice of Teaching in Secondary Schools* (Chicago: University of Chicago Press).

or teacher to keep the record himself without telling the pupil that it is being done. In this way can be revealed such facts as that the pupil is wasting much time, that he does not get to work promptly, that he has no systematic plan of study from day to day, and other evidences of faulty use of the time available for study.

*f.* Since neat, orderly management of written work probably eliminates some faults due to confusion, carelessness, and crowding of work, such a device as Knight's *Neatness Scale for Work in Arithmetic*<sup>1</sup> may serve both to bring to the attention of more pupils the untidy appearance of their papers and to suggest to them higher standards of performance.

*g.* In many instances, because of the lack of satisfactory standard diagnostic materials the teacher will be required to devise various types of informal exercises adapted to the problem at hand. These exercises may range from short units of work prepared on the spur of the moment to enable the teacher to deal with a specific difficulty to carefully prepared objective test exercises that may ultimately become standardized. Many of the devices can be modelled on patterns of standard tests or may be new adaptations of old techniques.

Professional courses for teachers should obviously include an adequate consideration of such diagnostic exercises and techniques as are now available and adequate practice in applying them if instruction in our schools is to be made more effective than it now is. Further, because of the unusual character of some of the difficulties to be diagnosed, the teacher may be called on to invent some ingenious method or device. Naturally it may be difficult to interpret the results secured because comparable data would be lacking. This fact should not prevent the ingenious teacher from attempting whenever necessary to devise some sort of test exercise which may clearly reveal the nature of a deficiency. For example, the teacher will find the observation of eye movements by means of an ordinary mirror a revealing procedure. To determine phonetic deficiencies of the pupils teachers can easily select from standard lists of words groups of words sampling the various important phonograms. The results of such an exercise in the hands of an alert teacher will quickly reveal the probable weaknesses. To measure the pupils' rate of silent reading, the teacher can select material similar in difficulty to that contained in a standard test and secure a fairly reliable index of the rate at which the pupil would read in the test exer-

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<sup>1</sup> Published by Scott Foresman Company, Chicago.

cise. Helpful comparison of the rate in the informal test can then be made with standard rates. Informal, unstandardized neatness charts, handwriting scales, composition scales, and similar types of objective materials, very helpful because of the ways of diagnosing deficiencies they provide, can be prepared by practically any group of teachers who appreciate their significance and value as an aid in teaching.

### 5. The Interview

a. In many cases it will be necessary to supplement the information secured through the use of other procedures outlined in the preceding sections by facts that can be best secured through an interview with the individual or his associates. In a sense, such an interview can in many respects be in the nature of a test situation, for fairly well standardized interview forms and blanks are available. The Binet test, for example, is in a sense a standardized interview. On the other hand, much of the information that the examiner may secure as the interview proceeds will necessarily pertain to behavior peculiar to the individual examinee. The value of the formal type of interview blank lies in the fact that it is less likely that significant types of information or symptoms of various types of maladjustment will be overlooked.

b. In cases in which other methods, such as tests, observations, and the like, do not yield satisfactory results, the interview must be used. For example, if the attempt of the pupil to write out a statement of his methods of study does not give an adequate picture of his methods because of his inability to analyze his mental processes clearly, the follow-up by means of an interview in which an attempt is made to assist the pupil to analyze them by judicious questioning is an obviously desirable procedure.

c. In some cases the interview must be used to clarify reactions that are not readily evaluated. An analysis of the pupil's written work may suggest that he is apparently using a faulty procedure, but to avoid incorrect inferences as to his methods, the examiner should interview him to verify his diagnosis. If in addition to observable activities readily recognized, an observer wishes to determine as nearly as possible what the learner's mental activities were — as in studying the spelling of a group of words — this information can best be secured through a systematic interview, consisting of a series of searching questions intended to bring out the essential techniques employed.

### 6. Laboratory Procedure

When the data supplied by analytical tests and informal diagnostic techniques of the kind just described do not locate the difficulty, or when a more precise analysis is desired, the more systematic, exact techniques of the psychological laboratory may be employed. The kymograph, kinetoscope, motion-picture camera, dictaphone, and combination voice and motion-picture methods furnish permanent records of the pupil's performance under more carefully controlled conditions than exist in the usual classroom. These records make possible repeated studies of the same performance and more precise analysis of its characteristics than can be obtained by other means. Small but important symptoms that escape ordinary observation are more easily discovered. Laboratory techniques thus make possible a much finer degree of analysis than can be secured by non-laboratory methods. Laboratories require expensive equipment and highly trained technicians, which many school systems cannot provide. However, all schools can make use of the findings of laboratory studies.

## VI. LIMITATION OF AVAILABLE STUDIES OF ERRORS AND FAULTY METHODS OF WORK

Detailed lists of the kinds of errors pupils make in algebra, arithmetic, spelling, English, and reading are available. These lists have been supplemented by carefully arrayed descriptions of apparently faulty methods of work, ineffective study habits, and undesirable behavior traits. However, these studies have a number of limitations. Some of the lists are substantially complete and of great value in diagnosis; others are so general that they are of little assistance. Many of the studies that contain detailed lists of the kinds of errors made most frequently by children contain no information as to their cruciality as symptoms of important deficiencies or as factors that may subsequently lead to serious maladjustment. Very few of the studies of errors or apparently faulty methods of work contain data showing differences between the reactions of pupils whose performance is satisfactory and those whose work is unsatisfactory; that is, they give little evidence concerning valid methods of differentiating the performances of pupils of inferior and superior ability. Some of the faults listed are found in the work of both superior and inferior pupils. Little is known concerning the prognosis of various types of difficulties and faults. Very few studies are available that deal with the persistency of error in the work

of pupils, a very important factor in arriving at a valid diagnosis. Little is known concerning the extent to which various types of specific difficulties are usually eliminated as the learner matures. Little is known concerning the relation between the kinds of errors made and the conditions under which they are made, although it is recognized that the performances of the learner on particular tasks vary widely under different conditions.

Those who have made analyses of errors and methods of work have clarified many issues relative to the characteristics of learning. For some difficulties, suitable remedial exercises have been suggested; yet little exact information is available concerning the effectiveness of the various proposed remedial measures for correcting particular kinds of difficulties. That many difficulties can easily be corrected is apparent from the results of ordinary instruction. Teachers, individually and as a group, have accumulated a mass of techniques that they apply with varying degrees of assurance and success. This same condition of uncertainty existed in the field of medicine before the techniques of modern science were applied to the study of the prevention and cure of human ills. By means of similar scientific techniques the remedies for crucial faults and learning difficulties, as well as techniques for averting their incidence, should be experimentally established in education, so that the teacher may undertake corrective work with reasonable assurance of attaining the desired results. Here are also involved materials of instruction. It is perfectly clear that at present much of our teaching is not intelligently directed toward the achievement of desired goals because we know so little concerning the effectiveness of the materials or methods of instruction that we use. The contrast between the scientifically validated techniques of the medical practitioner and the unsystematic, unscientific procedures of the educator is very striking.



## CHAPTER IX

### THE PLACE OF THE PSYCHOLOGICAL LABORATORY IN EDUCATIONAL DIAGNOSIS

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Some time ago the writer was attempting to discover why a certain elementary-school boy was experiencing so many difficulties in column addition. The boy had better than average intelligence and, on the whole, was succeeding quite well in his school work. However, in column addition he had no end of trouble, being both slow and inaccurate. Casual observation of the boy's work indicated nothing except that it took him an exceptionally long time to secure an answer and that quite often the answer was wrong when he got it. In order to secure more detailed data on the case, the writer had the boy add a column of digits in front of an eye-movement camera, and a photograph was made of the boy's eye movements while he added several columns of figures. When the photographic record was plotted, it indicated that the boy did not proceed regularly either up the column or down the column, but that he skipped about a good deal, apparently adding digits in a random fashion rather than in serial order. The boy gave a perfectly lucid explanation as to why he added in that way. His statement was that he did not like to add and, consequently, he wanted to get the worst of it over as soon as possible. Therefore, he began by adding all the nines and then the eights and the sevens and so on down to the small numbers, explaining that by so doing he got through with the hard part of the example first and did not mind the remaining additions of small digits. A cursory analysis of his eye-movement record indicated that, while this was his general method, his haphazard way of skipping about the column caused him to omit some of the digits entirely and to add some of them twice, which was sufficient reason to account for his wrong answers. When this was pointed out, the boy decided to change his habitual method of adding and to proceed regularly down the column, beginning at the top. While he did not think this was as interesting a way of adding as his former method, he

soon found that the results were more reliable and his ultimate satisfaction in adding in this manner was much greater. His case furnishes a simple but clear example of how a single habit of work may be the specific cause of a great many difficulties and also how the substitution of a superior method of work may eliminate the causes of errors.

### I. THE ADVANTAGES OF LABORATORY TECHNIQUES IN DIAGNOSIS

The preceding account supplies an excellent illustration of certain fundamental contributions of the laboratory method. In the writer's opinion the outstanding contribution of the laboratory to educational diagnosis consists in the detailed analyses that are provided of the processes carried on by the pupil as he works. Through the use of various kinds of laboratory instruments, important symptoms that would escape ordinary observation may be detected. This refinement of observation makes possible a degree of analysis that in many cases cannot be approached by other techniques.

The laboratory method also has the advantage of securing permanent records of processes so fleeting in character that, while they may be observed without the aid of laboratory instruments, the impressions from a single brief observation are insufficient to provide for careful study. By securing permanent records the laboratory makes possible a detailed study and analysis of processes highly significant in learning. These advantages of refined methods of observation, together with permanent records, will be more apparent in the discussion which follows.

Certain types of laboratory diagnosis are too technical in character to be applied in general in public schools. They frequently require the use of expensive apparatus, and they must be carried on by technicians skilled in the use of the apparatus and able to interpret the records secured. The fact that complicated laboratory experiments cannot be carried on in public schools by teachers without technical training in such work does not mean that the laboratory method has little value for education. If its techniques are applied to certain crucial problems in learning, the general patterns of learning may be so clarified that a methodology can be worked out that will have a very general application in all classrooms.

A good illustration of this fact is shown in some of the laboratory studies of reading. Prior to 1915, silent reading had made little headway in public schools. In the following half-dozen years certain laboratory studies made by Judd and his students made clear the fact

that silent reading and oral reading are two very different processes and that training in one does not necessarily produce proficiency in the other. After laboratory studies had pointed out the fundamental differences between the oral-reading and the silent-reading processes these facts were translated into methods of teaching reading at the primary level, and some very fundamental contributions were made to the methodology of teaching reading. The interesting fact about this is that not until the laboratory had pointed out the essential psychological differences in the processes of learning to read orally and silently did the school give general recognition to these differences in its teachings. It was not necessary to repeat the laboratory studies in public schools, but rather to generalize from the results of certain fundamental studies carried on by experts.

## II. LABORATORY DIAGNOSES SUPPLEMENT, BUT DO NOT SUPPLANT, OTHER TYPES OF DIAGNOSIS

Laboratory experiments often furnish the original observations of symptoms that may later be identified without the use of laboratory apparatus. This is illustrated in the case of the boy described in the first part of this chapter. After the eye-movement records had indicated how commonly children skip about in adding a column of digits, other methods that involve no apparatus at all may be devised to give the same information. For example, a child may be told to point with his pencil to the digit he is adding at each combination, and by so doing his procedure up or down the column may be noted. In many cases the initial observations for defining a symptom were not noted in the ordinary process of teaching, but its detection awaited the application of more precise techniques. As a general principle, the relationship between laboratory and classroom diagnosis might be stated as follows: Study a process in the laboratory until all the evidence necessary for a thorough analysis of a difficulty is at hand. When the characteristic difficulties have been identified through laboratory observation, a search may then be made for methods of direct observation or for simplified techniques that might be used in a classroom, but that would correlate sufficiently with laboratory results to enable the classroom teacher to identify the difficulties. Furthermore, teachers should be made aware of the general scientific literature growing out of laboratory experiments, which in many cases furnishes valuable suggestions for classroom or individual diagnosis. The principal or the supervisor will probably have to assume the responsibility for familiarizing teachers with this type of scientific literature.

### III. TYPES OF LABORATORY DIAGNOSIS

#### 1. Laboratory Studies of School Activities Involving Skill

The school is concerned with a variety of activities involving a fairly high degree of skill such, for example, as handwriting, typewriting, shop work of various sorts, manipulation in laboratories, instrumental and vocal music, and so forth. In most of these acts of skill the ultimate performance involves a degree of speed that makes it impossible to analyze the movements through unaided observation. The teacher may note from ordinary observation that the result of the movement is not so high a degree of skill as is expected or that in certain parts of the operation the pupil is awkward or even inaccurate in his movements. However, it is almost impossible, without the aid of laboratory instruments, to make any detailed analysis of these acts of skill after they have passed the first stages of slow movement.

A good illustration of a contribution of the laboratory to subjects of this type may be obtained from following the experiments in handwriting during the decade from 1910 to 1920. During that period the experiments by Freeman and others exhibited a method of attack on handwriting that was entirely new to the teaching profession of that time. For example, in Professor Freeman's laboratory were instruments that showed just what was contributed in writing by each finger and by the various movements of the hand, the wrist, and the arm. Kymograph records were made showing the amount of pressure on the paper from stage to stage as the child learned to write. Motion pictures were made to show just how the various letters were formed and to make possible a still more detailed analysis of various characteristics of the handwriting movement. Through the use of motion pictures and other apparatus, records of speed in handwriting were secured that made possible a precision in the analysis of writing never attained before. Laboratory methods were also applied to the study of the product of handwriting as well as to the process of obtaining it. Samples of writing were analyzed into various elements, such as letter formation, spacing between letters, quality of line, the degree of slant, and uniformity of alignment. The experience of a decade of laboratory investigations of the type just mentioned resulted in a new methodology of handwriting, which is quite superior to that existing before the year 1910. Furthermore, the contributions of the laboratory have enabled the teacher of handwriting to point out to the child specific faults both in the process and the product, and improvement in handwriting has been made

easier to attain. The accounts of the scientific experiments carried on are given in several highly technical monographs, but their application has now been translated into simply stated methods of teaching that are quite commonly applied.

Studies of a type similar to those in handwriting, but less well-developed at the present time, might be mentioned in the case of typewriting, which has been analyzed in considerable detail; of instrumental music, where laboratory analyses are barely begun; and of various aspects of shop work, where superior practices have resulted from scientific analysis.

## 2. Diagnosis through the Aid of Time Records

A great many types of laboratory studies have been based upon the amount of time required for different kinds of operations. In most of these experiments some simple form of securing a permanent record of time intervals has been employed, as for example, the use of various types of kymograph records. Two sorts of studies may be used here for illustration.

For twenty years the teaching of arithmetic has devoted much time to the development of automatic mastery of the number combinations. The use of drills is perhaps the best characterization of the methodology of this period. The degree to which number combinations actually are made automatic can be determined easily by having a child carry on some number operation, such as addition or subtraction or multiplication, and at the same time securing on a kymograph record by means of a tap key the interval of time required for each successive operation in the process. If the process is column addition, the kymograph record might reveal in fifths of a second the time required for each successive combination. Records such as these have indicated that mastery of the number facts is still far from complete automatism, and that the amount of time used for successive operations is far from uniform. By further study of combinations that require more time, the teacher often is able to find the cause of the difficulty in adding.

Another application of the method of securing time records on a kymograph drum is illustrated in the study of the rhythmic grouping of words in reading. The meaning of a sentence does not consist in the arithmetical sum of the words contained in it. However, a very common fault in reading, particularly in the primary grades, is the fault of pronouncing the words one by one with equal emphasis, as though

the entire attention were being given to the meaning of the individual words rather than to fusing them into larger units of meaning. This tendency in reading was pointed out as long ago as the reports of Horace Mann, when he was Secretary of the Board of Education in Massachusetts, and the difficulty of teaching children to read in rhythmic thought units is encountered perennially. This form of word-reading may occur either orally or silently, but the oral process furnishes the most convenient means for identifying it. Laboratory studies of the reading of primary children have been made in which the child read into a dictaphone, thus providing a permanent record of his reading. The interval between each word read was then measured by securing, on kymograph paper, a record of the amount of time between the pronunciation of each word. For those children who pronounced the words without any recognition of their relation to thought units, approximately the same amount of time elapsed between each word, but among the better readers of the grade there developed a distinct tendency to group words in thought units and to pronounce words belonging in a single thought unit in close sequence, leaving a greater pause between the units. It is easy to simplify this technique, thereby providing a ready means for diagnosing a common fault in reading in the primary grades.

### 3. Diagnoses Made through the Photographing of Eye Movements

The analysis of various aspects of reading by means of eye-motion photographs has now been reported in more than fifty published studies. The technique is probably familiar to most of the readers of this chapter. Briefly stated, it consists in the photographing on a moving film of a beam of light reflected from the cornea of the eye as a person moves his eyes across the lines of print while reading. For precise work of this type there is necessary rather elaborate apparatus that indicates not only the exact position in the lines of print at which a person looks with each successive fixation, but also, by means of a timing device, the duration of each fixation. The significance of studies of this type grows out of the fact that the tiny movements of the eyes furnish objective symptoms of the general character of the reading process of the person being studied. From the record of eye movements it is possible to identify good or poor reading, the stage of maturity of the reader, the particular character of many types of difficulties, and the general pattern of perception as the subject reads.

If a standard paragraph of easy material is used, it will be found

that children in the first grade make many fixation pauses per line and require a fairly long pause for each fixation. They also make many backward or regressive movements as they read the lines of print. By the time these children have become mature readers they make approximately a fourth as many fixations per line; the duration of the fixations is less than half as long; few, if any, regressive movements appear.

Sufficient study has been made of the progress of children from the first grade up to the college level to identify in considerable detail the characteristics of learning to read at the various levels. It is possible to identify fairly accurately the level of maturity of a pupil at any given time. Moreover, these studies make it possible to go very much further in diagnosing difficulties in reading. For example, vocabulary difficulties are reflected in the character of the eye movements to such an extent that, whenever an extremely difficult word is encountered, the whole perceptual process is changed in character and the difficulty is indicated by a group of fixations centering around the word in question. The fixation pauses in such a case are longer in duration than normal and in many cases the eye oscillates back and forth across the word until its meaning is determined. The eye-movement records also furnish a symptom of the nature of the reading being done; there are many fixations per line in careful reading and fewer fixations in cursory and rapid reading.

A number of specific diagnostic symptoms may be obtained from the eye-movement technique as applied to reading. First, the general span of recognition can be identified from an inspection of the number of fixations made per line at various levels of maturity. Second, the rate of recognition can be determined from the average duration of a fixation pause. Children who are slow in rate because of slow perception can be differentiated from children who are slow in rate of reading because of vocabulary difficulties or because of lack of ability to deal with complex reading situations. Third, the number and character of regressive movements indicate, on the one hand, the degree of rhythmic and regular habits of perception and, on the other hand, certain specific types of difficulties, such as those caused by difficult words, difficulties due to the sweep of the eye from the end of one line to the beginning of the next line, or difficulties due to a narrow eye-voice span.

In addition to identifying these general symptoms of considerable value in diagnosing difficulties in reading, the eye-movement studies have been highly valuable in analyzing certain special types of reading. For example, in the field of foreign language, comparison has been

made of pupils taught by the direct method and by the indirect method, using the general characteristics of eye movements as criteria of maturity. The superiority of the direct method for purposes of teaching to read is plainly evident from such data. In the case of Latin, the results of the ordinary methods of translation used in high schools very seldom shows, as indicated by the eye-movement records, any real ability to read, the process resembles deciphering much more than it resembles reading. However, when pupils are taught Latin by a method different from ordinary translation, results may be obtained in a three-year period comparable in character with results during a similar period of learning to read French or German. The application of the eye-movement technique has also been made to the reading of Chinese and Japanese where, owing to the very different character of the language, the behavior of the eyes is considerably different from that in reading English. Several studies have been made that show how the eye reacts to the reading of symbols, formulae, numerals, and abbreviations. Investigations have also been made of the reading of shorthand, from which it appears clear that teaching stenographers to read shorthand is probably more difficult than teaching them to write it. The contributions of such studies to methodology of teaching shorthand is now in the process of being made.

The technique of photographing eye movements has also been applied to the reading of music, where certain types of difficulties are clearly revealed that are hard to identify without the use of this type of laboratory analysis. Such factors as rate of playing, the difficulty of the musical composition, and the character of the printing of the musical notes on the page have a marked effect on the ability of the individual to read music fluently.

Two studies have been made of the nature of eye movements in studying spelling. Various methods of looking at a word while studying spelling have been described, and some attempt has already been made to identify certain types of studying with success in learning to spell. For example, some children study a word by repeating letter after letter, and the eye-movement record shows the tiny movements of the eyes as they proceed across the word over and over again. Other pupils concentrate upon certain difficult portions of the word; still others seem to study syllable by syllable. The particular contribution of the laboratory in a study of this kind is again the degree of analysis that it affords of a process difficult to observe by the ordinary methods of crude observation.

A still further application of the eye-movement technique is now being made in a rather elaborate study of the methods of perception when looking at pictures. By a specially constructed apparatus it is possible to secure eye-movement records in both vertical and horizontal planes at the same time and thus to determine exactly where the eye is focusing from fixation to fixation. Comparisons are being made of the way children and adults study pictures and of the effect upon perception of such factors as color, action, and detail of various sorts. The study also reveals the extent to which the generally accepted theories of the artists as to what the eye does when looking at a picture corresponds to the actual behavior of the eyes as indicated in the photographic records. Here, again, the laboratory contributes a degree of analysis and of objectivity heretofore not available, which aids the teacher in understanding what a child does as he studies a picture.

One may summarize the contribution of the studies of eye movements by saying that they provide for the teacher a degree of detailed understanding of mental processes carried on in various operations that would be impossible to secure otherwise. From these analyses the teacher gains a much clearer understanding of difficulties in learning and is able to make a more specific diagnosis of the difficulties encountered in teaching the various school subjects.

#### 4. Diagnosis Aided by Motion and Sound Films

The development of reasonably cheap methods of making sound motion pictures has added a valuable technique to the educational laboratory. The outstanding value of this technique consists in the fact that a permanent record of classroom or individual activities may be made that can be analyzed subsequently through repeated observations. These repeated observations make possible a much greater degree of analysis than can be obtained from a single direct observation of an activity where no repeated study is possible. As a simple illustration of the application of this technique an experiment carried on recently in the writer's laboratory may be cited. The problem was to determine the effect of various kinds of distraction upon a group of pupils taking an examination. Ordinary observation does not permit one to notice every pupil in the class at the same time, but, by making a motion picture of the children while they took these examinations, the effects of various sorts of distractions could be studied at leisure after the film was developed. The distractions used were such

as whispering in the back of the room, having the teacher write on the blackboard, having someone enter and leave the room during the examination, having someone drop a ruler on the floor, and other items of this nature. By analyzing the motion-picture film, it was possible to determine how many children were affected by each type of distraction, to measure the length of time before various children returned to full concentration on their work, and to identify those children who were repeatedly distracted in contrast with those who on the whole gave very close attention to the examination. Two hours spent in repeated observation of motion-picture film of this type will probably give the teacher a much better idea of the individual characteristics of various members of the class than she will obtain in a great many hours of ordinary observation. Furthermore, this makes possible the diagnosis of the characteristics of the individual study habits of each child in the class under conditions that can be held constant and can be carefully controlled for purposes of the study.

By securing a sound picture of a class during recitation or discussion one can go even farther in diagnosing the peculiar characteristics of each child's reactions. The rate of response to questions, the duration of individual recitations, the analysis of oral composition during discussion, and the general atmosphere of the entire class procedure can be studied in great detail when one has a record before him which can be repeated over and over again during the process of analysis. As the making of sound films becomes cheaper and the manipulation of the records easier, the school will find here an instrument of diagnosis of very high value.

##### 5. Diagnosis by the Aid of Voice Records

The work of Professor Seashore, in his studies of musical talent at the University of Iowa, illustrates the value of the laboratory method and of persistent attack upon a single subject of research. By a combination of oscillograph and camera it is possible to take a photographic record of the voice and to identify from this record the precise pitch of the voice, the amplitude of the sound, the various aspects of time and rhythm, and the general characteristics of the voice that are denoted as 'timbre.' This technique provides an objective record for comparing the singing of one person with another, and in diagnosing a particular form of difficulty the instructor in music can secure an objectivity heretofore lacking. This same technique has wider ap-

plications in various forms of educational diagnosis. In due time it should be expected to contribute as much to the understanding of ordinary speech as has the eye-movement technique to the process of reading. The contributions of the laboratory in dealing with the pathology of speech go much farther than the use of this single technique and, as revealed in studies carried on in Professor Travis's laboratory, show the very decided contribution of technical laboratory analyses in dealing with problems of that type.

#### 6. Diagnosis of Emotional Tension

A common observation during the taking of an ordinary examination is that certain children are working under very great emotional strain, whereas others seem to exhibit no particular tension and to be quite unconcerned. It is well known that emotional tension affects other mental processes and that the person who is too highly excited during an examination, or any other type of educational work for that matter, is handicapped on this account. At present it is difficult to identify those who are working under undue emotional strain. Introspective accounts are too subjective to be reliable. Ordinary observation may be deceptive because some individuals who work under great emotional strain have learned to put on an external appearance of calm. Psychologists are working on techniques for diagnosing various types of emotional tension. The problem is exceedingly complex, and it will probably be a decade or more before reliable techniques are standardized. However, through the use of various types of apparatus to measure blood pressure, heart beat, breathing rate, amount of perspiration, and other physiological responses accompanying emotional behavior, the laboratory technician hopes to discover certain symptoms of practical value in diagnosing emotional behavior. Needless to say, the application of such techniques, if they are once verified and standardized, will be much broader than the analyses of reactions during examinations; in fact, the general social behavior of children may furnish the greatest opportunity for diagnoses of this type.

#### 7. Miscellaneous Diagnostic Symptoms Studied in the Laboratory

Space is not available to treat in detail all the diagnostic symptoms that grow out of laboratory diagnoses. There is a long list of simple diagnostic tests that can be made in the laboratory and that have come to be matters of common knowledge. A good many years ago Pro-

fessor Whipple summarized many of these laboratory exercises.<sup>1</sup> Measures of reaction time, of steadiness, of ability to react in rhythmic patterns, as in the case of keeping step, and many other tests of motor reactions have come to be specifically useful in certain types of educational diagnosis. Likewise, a number of laboratory tests of sensory acuity have also become very well standardized; for example, the measures of near-sightedness and far-sightedness, muscular balance of the eye, astigmatism, ocular dominance, acuity of hearing, and various forms of kinesthetic discrimination. Tests of this sort have come to be standard procedures in dealing with abnormal cases, and they have considerable application to the general school population. Studies of right- and left-handedness, particularly in relation to language behavior, have considerably changed the attitude of the school toward children who have a normal preference for writing with their left hand, and the entire relationship between dominance of hand and eye to language behavior is still a subject of intensive investigation in the laboratory. Psychological tests as instruments of educational diagnosis are too well known to need any discussion here, but many persons who use and profit by the tests have forgotten that in the original construction of devices of this type it was the contributions of the psychological laboratory that made them possible.

#### IV. SUMMARY

The essential prerequisite of good diagnosis is a penetrating analysis of the form of behavior being studied. As in medicine, so in education, good diagnosis waits upon the identification of specific diagnostic symptoms. The discovery of these symptoms ordinarily is not made by crude observation. The refinement of technique made possible by laboratory instruments gives the laboratory a peculiar advantage in contributing to the techniques of diagnosis. The function of the laboratory, as the writer sees it, is primarily that of making the original analyses of behavior under conditions so rigidly controlled that significant symptoms may be isolated and described. Once these significant symptoms are identified, the problem is to simplify their application, as far as that can be done, or to derive from highly technical studies, where necessary, the general patterns of educational treatment that are beneficial. The contribution of the laboratory will be in proportion to its insight in developing means for identifying significant symp-

<sup>1</sup> G. M. Whipple. *Manual of Physical and Mental Tests* (Baltimore: Warwick and York, 1914).

toms that the teacher can use in discovering specific causes of difficulty in learning.

The number of educational laboratories in America where equipment and trained personnel are available for making genuine contributions to educational diagnosis is still regrettably small. It is doubtful whether as many as five percent of the institutions for the training of teachers have anything that could be reasonably classified as a research laboratory for making contributions of the sort described in this paper. The situation is not due primarily to the expense of carrying on laboratory work, although that is a considerable item. It is due chiefly to the fact that the profession at large has not understood the function of the psychological laboratory in contributing to educational methodology and diagnosis and has reasoned that, because public schools cannot institute these laboratories in their own set-up, therefore the laboratory is a somewhat foreign and impractical agency. Psychological laboratories for making detailed analytical studies certainly can be available in first-class institutions for the preparation of teachers and in those city school systems where the school board is willing to support an adequate bureau of research. In terms of long-time, fundamental contributions to education the psychological laboratory occupies a strategic position. If a somewhat greater proportion of the resources and energy of the educational profession could be devoted to basic and fundamental studies, the techniques of diagnosis available to the practical teachers and administrators might be very much increased.



## CHAPTER X

### MATURATION AS A FACTOR IN DIAGNOSIS

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The purpose of this chapter is to discuss educational growth as biological maturation: to define the maturation concept, to describe both the process and the factors involved, to present methods of appraising the degree of maturation in any given child or function, and to discuss the implications for general educational diagnosis, so far as it is possible to carry out such an ambitious program within the limits of one brief chapter.

'Maturation' is fundamentally a biological concept. It may be described in a general way as progress toward a mature, or terminal, state or condition. A seed, a kitten, and a baby differ in evident ways from the organisms from which they spring. As an immature being passes through the series of changes we designate by the general term 'growth,' we say that he is maturing. When these characteristic changes cease, we call him mature. In general, 'maturity' connotes both (1) that cessation of growth which occurs when the immature organism has attained resemblance to the forms and functionings of the organisms that produced it, and (2) that efficiency and completeness of functioning which is associated in our experience with perfected or completed structures.

Maturation phenomena are well known to all of us. Few teachers have failed to witness the series of events in the development of plants and animals to which we apply the term. For example, flies may be seen laying eggs. From these eggs hatch tiny worms that eat and increase in size until at length they pass into a resting stage during which a profound metamorphosis takes place. From the resulting pupae issue, in time, mature flies like the parents which laid the eggs. This completes the cycle of maturation.

So, too, with educational growth. There are levels and cycles of development. Most children creep before they walk, speak before they read, read before they write. The analyses of recent years have proved

that 'reading ability' is not a simple unitary process; it is multiple and complex. To 'read and follow directions' is distinct in certain ways from 'reading for appreciation,' or 'reading in order to summarize.' Moreover, not only does the development of reading ability pass through various levels or cycles, but the degree of development at any one time is dependent upon the concomitant development of many organs and of many other abilities, such as ability to control the movement of the eyes. It is now quite generally believed that a child must have a mental development of approximately six years before it is profitable to give him training in reading activities. Similarly, the sudden increase in learning efficiency that in many children accompanies the increase in the rate of physical maturation immediately following the onset of puberty has been noted by many investigators. To those who recognize the fundamental importance of maturation, *every* diagnostic endeavor demands at the outset adequate knowledge of the degree of maturity achieved by the subject, not only in the particular ability or performance being analyzed, but also in all facilitating or contributory structures and abilities.

By analogy we apply the term 'maturation' to many situations which are not strictly maturations at all. For instance, mountains are called young or old, depending upon the degree to which they have been subjected to erosion, the plain being the final state toward which all mountains tend. The process of erosion, however, is not a biological process at all. Yet because erosion has three characteristics in common with true maturation, namely, an initial state, a process taking place in time, and a final terminal condition, we are not confused when mountains are described in terms of maturation. Nevertheless, the lack of exact definition of what is meant by maturation, plus the widespread application of the term to all sorts of situations that do not possess certain of the essential elements of maturation leads to endless confusion. We speak of crystals as growing, anger as developing, judgment as maturing, and so on without end. There is need, therefore, to give the various terms we use to describe growth some measure of precise meaning and to differentiate between processes that outwardly bear certain resemblances to maturation, but which actually lack essential elements.

Maturation may be defined precisely as 'the progress of an immature organism toward a mature, or terminal, state—a progress produced by constant forces acting under constant conditions.' The organism itself may be either individual or social, and the mature

state may be either that of the organism as a whole or that of any of its parts or functions. A particular tooth matures, and so does handwriting. Moreover, we judge the maturity of a child as a whole by the degree to which each structure and function is mature. Maturation as a general process is always a series of specific but interrelated maturations.

Under this definition the growth of a crystal is not maturation, but mere increase in size. In like manner we may say that the weather grows warmer or colder, but such growth is mere continuous change, not maturation. Further, if a child exerts sometimes much effort and sometimes little effort in a series of tests of his ability to add, his scores vary correspondingly, but such changes in scores are not to be called maturation: they take place under very different laws. But if we train and test the individual through a series of years, preserving and plotting all his scores as one continuous series, it is easy to trace underneath the chance variations from day to day the true maturation of the ability to add.

Most of the terms that cause confusion in describing growth are used for specific emphases. Thus, the simplest descriptive word is 'change.' It signifies merely difference. 'Growth,' however, usually implies continuous change in magnitude in a constant direction. The direction may be either positive or negative. 'Development' indicates that the speaker is describing an on-going, complex process that is resulting at each observation in a more complete product, while 'maturation' is used to define explicitly the nature of the process as one in which the product will become 'mature.'

Another term used by biologists needs consideration: 'differentiation.' All individual plant and animal life starts as a single cell. The cell grows and divides. As the number of cells increase, however, a different sort of change may occur. Certain cells become 'differentiated' in structure and functioning, and when mature, form tissues and organs that differ in characteristic ways from the other tissues and organs. Differentiation implies specialization. The term would not concern us here were it not for the fact that in any development both differentiation and maturation occur side by side as integral parts of the general maturation of the organism as a whole. For example, in the development of reading ability, or of skill in English composition, both growth and differentiation are to be observed. There is always danger, therefore, that one may be diverted from the maturation aspect of the situation by focusing attention too closely on some other phase of the

general process. Differentiation, occurring late in one's development, initiates a *new cycle* of specific maturation within the old. That is, general maturation is an affair of many maturations, and of recurrent cycles.

Nowhere is the confusion caused by such focusing of attention on a partial aspect of the maturation process greater than in those situations in which changes in conditions occur. For instance, suppose a boy is studying spelling under certain defined conditions. Day by day his progress toward the mastery of his spelling task may exhibit all the characteristics of a true maturation process. But if some day an extraneous force operates to change one or more elements of the situation, the maturation curve becomes correspondingly irregular. It may be that the teacher became dissatisfied with the child's progress and singled him out for additional instruction. It may be that a severe case of scarlet fever or mumps deranged the functioning of some endocrine gland. Whatever the cause, when extraneous forces act to alter either nature or nurture, the whole sequence of maturation adjusts itself to the new conditions. However, the changes that are evidences of this adjustment should not be called maturation, or even growth. Extraneous forces merely alter the conditions under which maturation takes place. They affect the rate or character of maturation only *indirectly*.

The writer calls any extraneous force that operates to change either nature or nurture during the maturation process a 'modifying influence.' An understanding of the part played by modifying influences in thus *changing the rate of maturation* is the key which unlocks the whole of the biological puzzle. In general it may be said that maturation is measured by the *rate of growth*, but the effects of modifying influences are measured by the *change in the rate of growth*. The progress of maturation under constant conditions proceeds according to law and is predictable. Less is known about the operation of extraneous forces. Their effects may be precisely measured when they act, but the incidence of a modifying influence is, at present, unpredictable. A new factor may appear *at any moment*. However, such appearances are far less frequent than is ordinarily supposed, and when they do occur, the departure from predicted growth is both a diagnostic signal that modifying influences are acting, and a measure of the magnitude of their effects.

These general abstract definitions take on more meaning when applied to specific situations (Figure 1).

In Figure 1 are shown two maturation curves — one the ossification of a particular bone in the wrist,<sup>1</sup> the other the spelling of the word *transfer*<sup>2</sup> — as illustrations of the general nature of the maturation process. Each is a *specific* maturation. Ossification is largely beyond

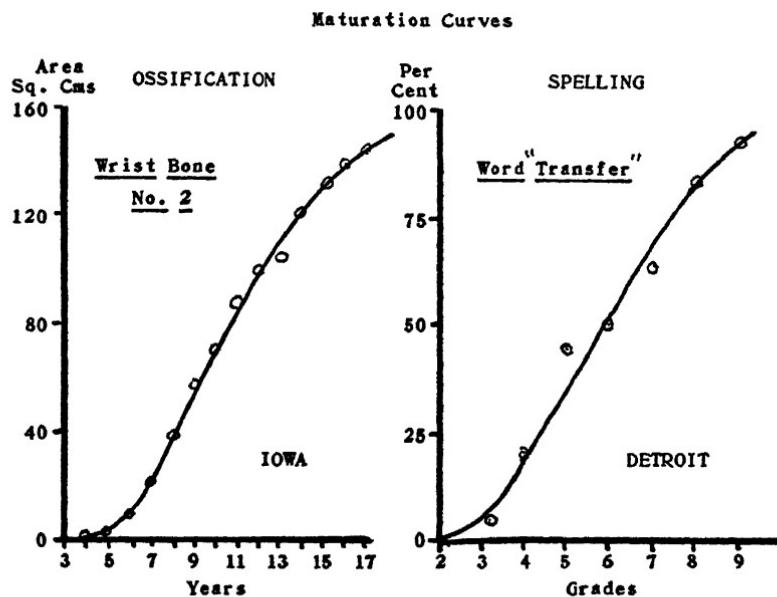


FIGURE 1.—TWO MATURATION CURVES, ONE PHYSIOLOGICAL, ONE EDUCATIONAL

Ossification is a process related to general maturation. The curve is based on the progress of ossification in a particular wrist bone and illustrates the general form of the biological growth, or maturation, curve. Spelling, a "learned" reaction, proves to be also a process of biological maturation. The second curve in the figure represents the development of ability to spell the word "transfer" by children in-grade-at-age. In spite of evident lack of constant conditions the curve approximates the "S" or biological growth curve in form.

control and proceeds under fairly stable and uniform conditions. Spelling matures only under environmental influences that may or may not act, and hence the maturation is less constant. Nevertheless the general forms of the curves are readily seen to be the same. In all learning situations, as the accuracy of control is increased, the learning curve approaches more and more closely the biological maturation

<sup>1</sup> From Anatomic Growth of Children, Studies in Child Welfare, Vol. IV, No. 1, Oct. 1928. University of Iowa.

<sup>2</sup> From the records of the Department of Research, Detroit Public Schools.

curve. A study of a large number and of a great variety of learning curves leads to the conclusion that *learning in its essential nature is a process of biological maturation.*

It has been found that under constant conditions all maturation curves, whatever the field, conform to a single pattern, and that the pattern may be described in a simple mathematical formula, or law (Figure 2).

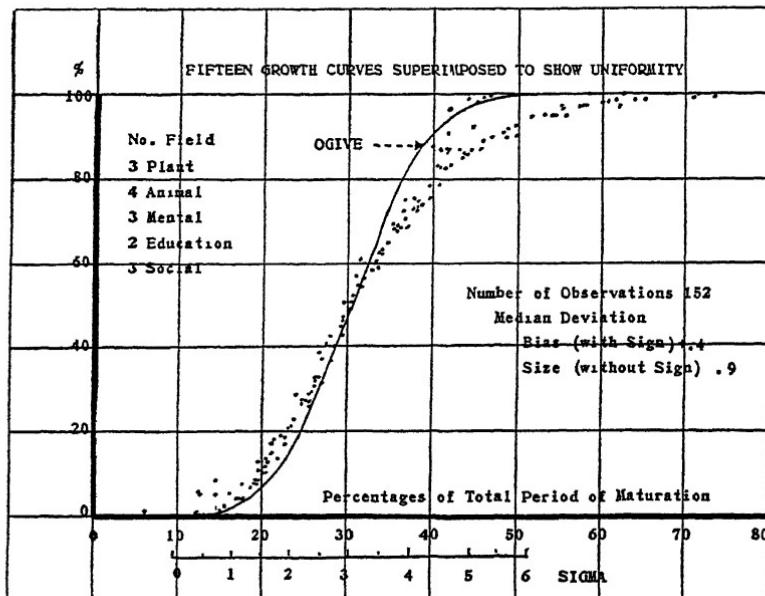


FIGURE 2.—FIFTEEN GROWTH CURVES FROM FIVE DIFFERENT BIOLOGICAL FIELDS SUPERIMPOSED UPON A COMMON BASE

These curves show the universality of the maturation pattern. Note that the different growth curves are not actually drawn in, but merely indicated by the 152 dots which represent the separate observations. The form of the growth curve can be seen by imagining a 'curve of best fit' drawn through the dots. Half the observations differ from mathematically perfect conformity to law by less than one percent. The curve that appears in the figure is an ogive from a normal distribution and is presented to bring to consciousness the difference in form between the ogive and the maturation pattern.

Diagnosticians should fix the form of the maturation curve firmly in mind as an aid in interpreting a child's behavior. In a new learning situation in which an individual's ability is low, there will be a period of orientation in which almost no development of ability will seem to take place. Ordinarily we do not allow time enough for this

phase of the learning process; we are too impatient for results. When visible achievement once begins, the returns from study, small at first, steadily increase, and growth soon takes the form of almost straight-line development. At about sixty percent of maturity, however, the returns from study begin to decrease, and the returns steadily diminish, so that approximately it takes twice as long to reach maturity as it did to reach the halfway point. Basing judgment on the time required for complete maturity, the conventional 75 percent passing mark, which occurs at 42 percent of the period of maturation, means very imperfect mastery. Just as we are too impatient for results at the beginning of learning, so we are too easily satisfied with approximations to mastery at the end of learning. The maturation curve suggests that permanence of retention can be expected only when learning has been pushed beyond 95 percent of development, and that the rapid disappearance of the products of learning must inevitably follow incomplete maturation.

Mathematical analysis shows that the entire maturation curve can be precisely described by the formula<sup>1</sup>

$$y = k i^r t$$

in which  $y$  is the measurement at the time  $t$ ,  $k$  is the ultimate development at maturity,  $i$  is the degree of development at the outset, and  $r$  is the rate of growth. This formula tells an important story for diagnosticians.

In the first place it emphasizes the fact that children grow to different maxima. Of course we all see daily that men and women are of different heights, but we seldom stop to think that a boy two feet tall, who when mature will be four feet tall, and a boy three feet tall, who when mature will be six feet tall, are really *equally developed*; for each is 50 percent mature, although one is a foot taller than the other. Similarly, two boys who make quite different scores in an achievement test not only may be equally developed because they are growing to different maxima, but may make unequal gains and yet each may be developing equally satisfactorily. In other words, interpretation of scores of individuals, to be precise, must be made in terms of the individual's own growth curve and not in terms of norms.<sup>2</sup>

<sup>1</sup> First generalized by Benjamin Gompertz in England. See *Philosophical Transactions of the Royal Society*, 1825, page 522.

<sup>2</sup> S. A. Courtis. "Derivation of norms." *Journal of Experimentation*, Vol. II, No. 3, 1934.

For efficient diagnosis the school must accumulate and graph all the individual measurements made from year to year. At present we are wasting our best diagnostic material when we throw away individual measurements as soon as averages are found.

In the second place, the formula calls attention to a new factor, the degree of development at the outset, incipiency, or *i*. Children are not born alike. The fact of individual differences is well established. Yet because these differences in the germ are infinitesimal, we tend to overlook or ignore them. The exponential formula emphasizes the fact that very tiny initial differences, compounded yearly, lead to very large differences in the resulting growth. At present all our interpretations of scores are 'messed up' by our failure to allow for the aptitude of the child for a subject. That is, a child with a high natural initial development in music and a low initial development in mathematics will appear to learn music readily and appear to learn mathematics slowly, when really he learns both with equal readiness but *starts at different points on the two curves*. Thus the incipiency factor is one of those wrecking our correlations between I. Q.'s and achievement, and generally spoiling our interpretation of all achievement scores.

In the third place, the constant *r*, standing for rate, tells us that, in spite of the varying form of the growth curve, the *rate of growth is really constant at all points on the curve*. This is very hard to accept until one has actually computed growth curves using a constant rate as exponent and witnessed the effect appear as an infinitesimal growth during the orientation period, an increasingly greater growth during the early learning period, and a constantly diminishing growth during the later learning period. This means that we must not make snap judgments about effort and merit based on achievements or even on apparent growths. A gain of one word in spelling at one portion of an individual's curve may indicate precisely the same effort as ten words at another portion of the same curve.

As a whole the formula indicates that learning takes place according to law and, under controlled conditions, is as predictable as events in the exact sciences are. Such a statement seems incredible to the average educationalist or even the average biologist, but it is strictly true. Even in data secured long ago, without adequate attention to control, the effects of chance factors in producing variation are usually within five, and frequently within two percent.

For instance, Scammon<sup>1</sup> reports the measurements of the heights of a boy taken almost every half year from birth to eighteen years of age. The boy was born on April 11, 1759, and the last measurement was made on Nov. 11, 1776. Yet at no point does any measurement depart more than 2 cm. from a mathematically perfect curve and the average deviation is but .6 cm. or a quarter of an inch (Figure 3).

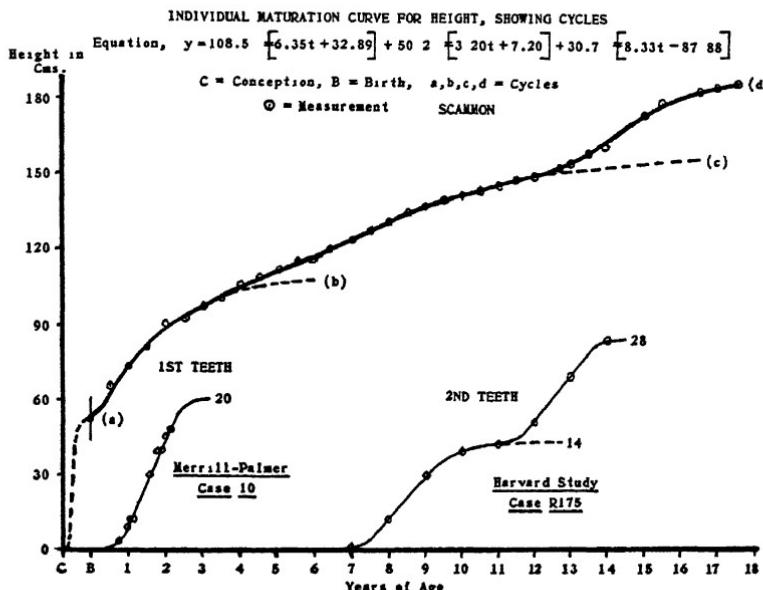


FIGURE 3 — THE GRAPH OF A MATHEMATICALLY PERFECT GROWTH CURVE

The curve fits well the eighteenth century data of Montbeillard on the growth of a single individual in height. Actual measurements are shown by small circles. In only five or six cases are the deviations greater than the width of the line.

The figure as a whole illustrates the fact of cycles in human growth. The other two curves in the figure, based on the cutting of teeth in individuals, are presented as evidence that the cycles in the curve for height are observable in other developments also.

The curve illustrates also another matter of utmost importance to the diagnostician; namely, that a human being passes through periods, or cycles, of development. The first cycle (a) of prenatal development covers embryonic growth. The second cycle of infancy (b) extends

<sup>1</sup> Richard E. Scammon. "The first seriatim study of human growth." *American Journal of Anthropology*, 10: 1927, No. 3.

from birth to four or five years of age. The third cycle (c), childhood, stretches from infancy to puberty at eleven or twelve, and the last cycle shown (d) is that of adolescent growth. Unfortunately so little is known about the causes of these cycles and they are so variable in time of appearance that their existence is even denied by some investigators. However, the evidence, both for them and for the variation in the times of their occurrence, is adequate and complete.<sup>1</sup> In the figure are drawn also two other curves, one of the cutting of the first teeth by an individual in the Merrill-Palmer School, Detroit, and one of the cutting of the second teeth by an individual measured in the Harvard growth study.<sup>2</sup> School teachers have long had close at hand a good index of the cycle of maturity attained by the individual, only they have not known it. To the trained eye, a glance into a child's mouth furnishes important information as to the progress of maturation. For two-thirds of the children a careful record of the rate of maturation of a child's teeth furnishes a good index of his I. Q.<sup>3</sup>

It should be noted that the curve for the cutting of the permanent teeth is a two-cycle curve. The second cycle may occur so early as to merge with the first cycle and make seemingly one curve. For instance, in the curve for height the cycles of infancy and childhood are so merged that unless one knew about the possibility of this merging one might never suspect that there were two cycles operating at this point. At birth this boy measured 51.4 cm.; during infancy he grew toward a maximum of 108.5 cm.; during childhood toward a maximum of 158.7 cm. (108.5+50.2); and during adolescence towards a maximum of 189.4 cm. (158.7+30.7), as shown in the isochronic<sup>4</sup> equation in the figure.

<sup>1</sup> Warren K. Layton. "A study of pubescence in junior-high-school boys" (Unpublished doctor's dissertation, University of Michigan, 1931).

Mary A. Leal. "Psychological maturity in relation to certain characteristics of boys and girls" (Doctor's dissertation, University of Pennsylvania, 1929).

<sup>2</sup> My indebtedness to both these institutions for their courtesy in supplying me with individual growth records is gratefully acknowledged.

<sup>3</sup> S. A. Courtis. "What does the I.Q. really measure?" *The Nation's Schools*, 11: January, 1933.

<sup>4</sup> Isochrones are units of computation based on the maturation pattern. See S. A. Courtis. "Maturation units for the measurement of growth," *School and Society*, 30: Nov. 16, 1929, No. 777. The equation ought to be written as a four-cycle curve, but data for the prenatal cycle are lacking. However, the form of the prenatal growth curve is known. See R. E. Scammon. *The Development and Growth of the External Dimensions of the Human Body in the Foetal Period* (The University of Minnesota Press, 1929).

The concept of 'cycles of maturation' is not only of importance in diagnosis and teaching, but also vitally affects all interpretation of measured behavior. For instance, many wordy battles have been waged over the constancy of the I.Q., but in general conclusions have been drawn from massed statistics. For most children all one needs

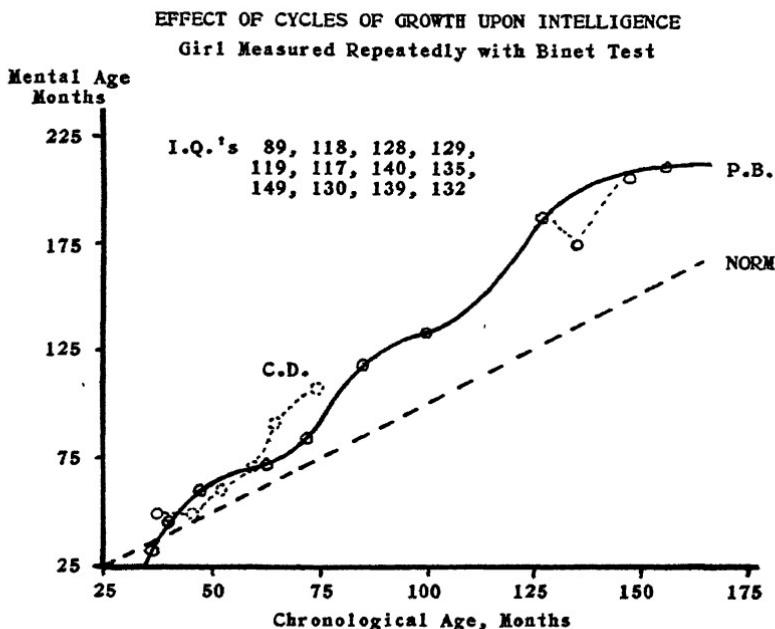


FIGURE 4.—THE MENTAL AGES OF A CHILD MEASURED REPEATEDLY WITH THE STANFORD-BINET INTELLIGENCE TESTS

From 35.8 months to 160.8 months her I.Q. varied from a low of 89 to a high of 149.<sup>1</sup> Her mental development curve reveals the existence of the same three cycles shown in Figure 3. The dotted curve for the mental development of child C.D. illustrates the fact that cycles occur at different times in different children. The curve of norms ordinarily gives but slight indication of the course of individual development.

to do is to plot successive measurements of mental age against chronological age to see that cycles of mental growth occur which correspond to those of physical growth, and make it impossible for the I.Q. to be absolutely constant. Moreover, since the cycles in one child do not occur at precisely the age they do in another child, their effects are

<sup>1</sup> I am indebted to G. D. Stoddard, of the State University of Iowa, for these measurements.

cancelled in any process of averaging to get norms. Eventually diagnosticians will replace the inconstant I. Q. with the constant *rate* of development, and will not expect even rate to be constant except during a given cycle, and under constant conditions (Figure 4).

The mental age of the child referred to in Figure 4 should be at *maturity* 220 months, which corresponds to an I. Q. of 115 if the conventional 192 months is taken as the norm for maturity. The value, 115, differs markedly from the I. Q.'s obtained at the successive measurements. The I. Q.'s misrepresent the girl's real intelligence because she developed later, and matured more rapidly, than the average individual. Precisely similar curves are obtained when curves for educational development as measured by achievement tests are drawn.

A most important phase of diagnosis is the determination of the effect of a specific factor upon educational progress. In this situation, also, the concept of maturation affords valuable aid. In the past, measurement-men have taken scores in achievement tests as measures of ability, but if one comes to believe that a child's performance is conditioned by his general development, it is easy to see that performance and ability are not at all the same thing. For example, if one wishes to measure the effect of teaching in spelling, one must first eliminate the effect of general growth. In other words, teaching is not measured by achievement, but by the *change in the rate of growth it produces* (Figure 5).

In the case shown in Figure 5 appropriate computations prove that the effect of teaching was twice as great as that of incidental learning. Unfortunately, however, the learning may not be permanent; for as soon as the teaching is over, forgetting sets in and the curve falls until it reaches the level of development *it would have had* if no teaching had taken place.

Figure 5 suggests a number of important ideas. One of these has been mentioned previously. When learning is not carried to mastery, gains in excess of general development are quickly lost. It would seem wise, therefore, to adjust education in quality, content, and amount to the natural limits of the general maturation process in the individual.

A second idea suggested is that nothing is fixed in education. Under given conditions a child grows at a certain rate, has a given I. Q., grows to a certain maximum, and so forth. If we change the conditions, however, his maximum, rate of growth, and so forth will change correspondingly. Rate of growth has two determining factors: the nature

of the child and the conditions under which he learns. When a child does not learn as rapidly as the average, it will ordinarily mean that the conditions are not adjusted to his nature. Consequently the wise teacher will study, first of all, the general maturation process in the child to see at which stage or cycle the child is, and how fast he is

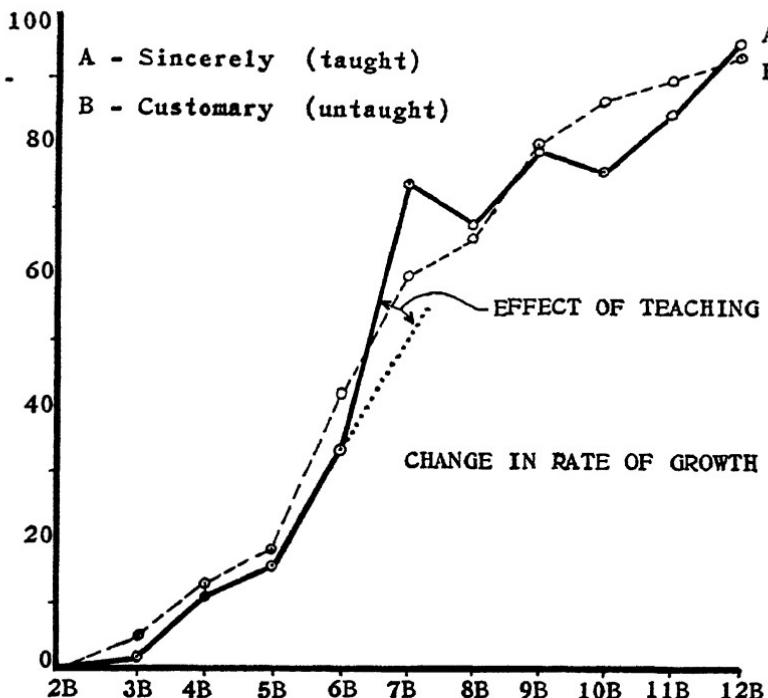


FIGURE 5.—THE MATURATION CURVES FOR TWO WORDS IN SPELLING AS REVEALED BY THE PERFORMANCES OF CHILDREN IN-GRADE-AT-AGE

The word *customary* does not occur in the course of study; maturation of this word is an illustration of incidental learning from general life experiences. The word *sincerely* is taught in the seventh grade. Hence, the maturation that takes place before the seventh grade is also caused by general life experiences. The curves of the two words mature at approximately the same rates for the first six grades. The effect of teaching is measured by the change in rate shown at the seventh grade for the word *sincerely*.

growing by nature. She will then make the adjustments in materials, methods, and conditions necessary to produce the growth normal for the child's stage of development. That there are limitations to the possibilities of development in certain children, no one will deny. It

would be foolish to try to teach sight to a boy born without eyes. But far fewer children than has been suspected are born without various specific organs, and the problem before the diagnostician is that of fitting educational experiences to the need of the individual. *Detailed knowledge of the general process of maturation is thus fundamental to all diagnosis.*

This point is so important that a specific illustration of the value of knowledge of concomitant developments for correctness of interpretation will be presented. A certain child was measured with a test of the addition combinations in February and the test was repeated each month until June (Figure 6).

#### TEST 1.—ADDITION

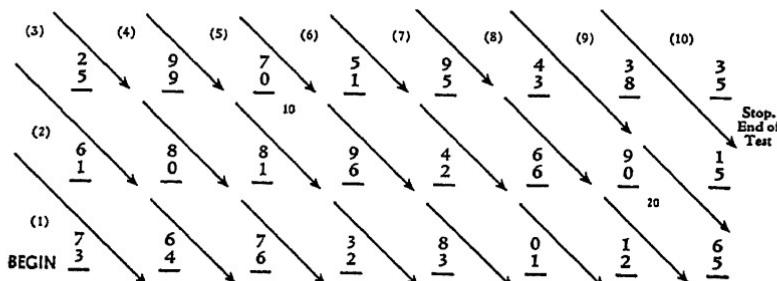


FIGURE 6.—A TEST OF THE ADDITION COMBINATIONS

Subjects are asked to work down the slanting lines to prevent them from looking ahead while copying

He was also drilled in giving the answers to the combinations, spending some 265 minutes in drills during the four months of the semester. His initial score in February was 20 combinations attempted and 18 right. His last score in June was 31 attempted and 31 right, a very satisfactory gain for a nine-year-old with an I.Q. of 94, as any fourth-grade teacher will admit. Nor was this gain made all at once, but steadily. Scores from the larger series of measurements made, corrected to 100 percent accuracy and selected to show development, were: February, 19; March, 23; April, 26.5; May, 30.5; June, 31.

In this case, however, additional information is available. At each testing period the child was also given a test of copying of figures (Figure 7).

This test calls out precisely the same motor responses as the first. The sole difference between the two tests is that in Test 2 the answers are copied, and no adding is necessary. The child was given no *direct*

practice in copying figures, but motor ability increases with age, and in the interval from February to June the child's scores, selected precisely as the scores of the first test were selected, changed as follows: February, 50; March, 59; April, 65; May, 72; June, 77.

If, now, we compute what percentage the score in addition at any test is of the score in copying, to see what the relationship is between them, we find that the boy could add 38 percent as fast as he could copy in February, 39 percent in March, 40.8 percent in April, 42.4 per-

Test 2.—Copying Figures

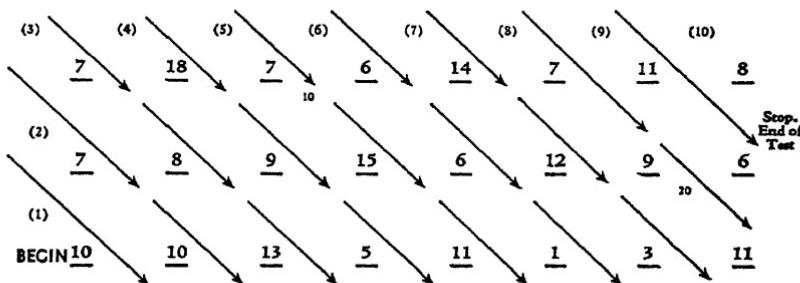


FIGURE 7.—A TEST OF COPYING FIGURES

The motor responses in this test are identical with those shown in Figure 6.

cent in May, and 40.3 percent in June. In other words, while the child's score in the addition test has risen from 19 to 31, as his muscles have matured (shown by his copying test), his *mastery of addition* has scarcely changed at all. Lest, however, someone hastens to say that the condition shown above is all that can be expected, note that another boy made the following record:

	<i>Copying</i>	<i>Adding</i>	<i>Percentage</i>
February	78	52	65.0
March	84	55	65.5
April	92	68	74.0
May	91	72	79.0
June	90	91	101.0

This second boy has shown growth in copying similar to that of the first boy, but he has also achieved complete mastery in addition. His age was 10.5, his I Q., 99, and he spent 650 minutes in practice. His performance in another test of adding, one involving two-column, six-figure addition examples, was in June, 32 tried and 27 right; while the first boy under the same conditions scored 14 tried and 6 right. Similar results might be shown for many children and for other subjects.

These data raise the question as to how much of the growth we measure with standard tests is maturation only, as in the case of the first boy, and how much is really caused by the teaching we do. It suggests also that a score in a single test is never a measure of any

RELATED DEVELOPMENTS  
Copying Figures - Adding

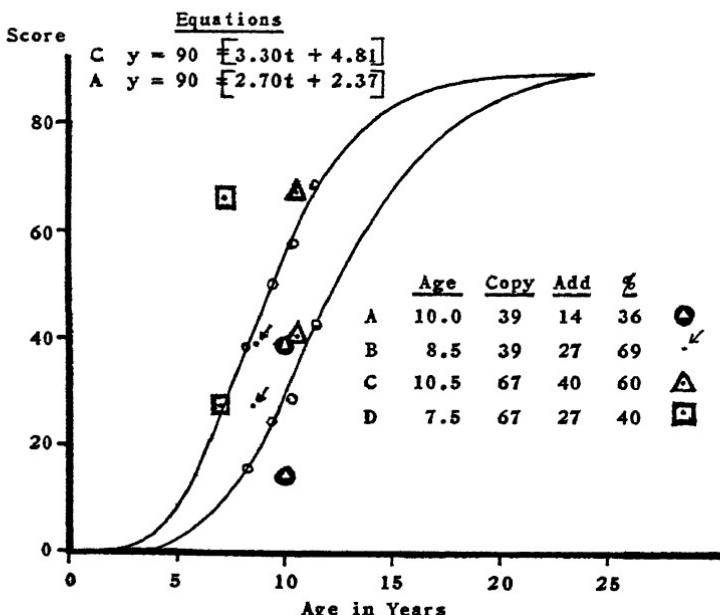


FIGURE 8.—A COMPARISON OF THE MATURATION OF PERFORMANCE IN COPYING FIGURES AND IN ADDING

The isochronic equations for the curves are given at the top of the figure, and show that the curves differ chiefly in their rates of maturation. The small circles on the curves indicate the average scores made by children in-grade-at-age in Grades III, IV, V, and VI respectively. The table gives the scores of individual children for comparison with the average curves. The positions of the individual scores are indicated by special symbols.

factor or ability by itself, that *differential testing is essential for valid analysis.*

The entire situation with respect to development of ability in copying and adding tests is shown in Figure 8.

Boys A and B have the same score in copying, but very different

scores in adding, indicating different degrees of mastery. Similarly, boys C and D copy at the same rate, and also show different degrees of mastery. Note particularly that C can *add* more figures in a given time than A can *copy*. Even if both knew their combinations perfectly, A ought not to be expected to make the same score as C because they have motor mechanisms that are either not the same or not at the same stage of development.

The curves suggest that, under our present system of teaching, perfect mastery of the combinations cannot be expected before 25 years of age. Certainly tests prove that college students have not achieved perfect mastery, although nearer to it than eighth-grade pupils. What the effect on education would be if efficiency were measured by teachers in terms of maturation and mastery, instead of in terms of mere achievement, it is difficult to prophesy.

One final illustration of the application of the concept of maturation to diagnostic measurements will be given. Superintendent C. V. Millard of Dearborn, Michigan, wished to compare the spelling performance of children in a certain fifth-grade class with the standards of the Iowa scale. Accordingly he prepared ten tests of ten words each, each test composed wholly of words taken from a single degree of difficulty in the Iowa scale, as nearly as was possible. The ten tests varied from very easy words to very hard words. The results secured in terms of the average percentage of correct spellings by tests were as follows:

PERCENTAGES OF CORRECT SPELLINGS

Tests	A	B	C	D	E	F	G	H	I	J
Iowa	99.0	98.1	96.4	93.3	88.8	78.0	56.2	40.9	18.3	4.0
Class	96.1	95.2	88.7	84.1	78.0	60.2	37.5	23.3	5.5	1.3
Differences, I-C	2.9	2.9	7.7	9.2	10.8	17.8	18.7	17.6	2.8	2.7
Ratios, C to I	.971	.971	.920	.901	.878	.770	.665	.570	.301	.325

The children were the same throughout. What conclusions can be drawn from such variable results? Yet it is certain that the ability of the children to spell does not change merely because the test is changed. Ten tests properly evaluated ought to yield ten approximately equal determinations of relative standing.

If, however, spelling performance is regarded as something that matures, then the data may be expressed in maturation units. The situation is recognized more easily if the various scores are graphed at the proper positions on maturation curves as in Figure 9.

The degree of separation between the Iowa and the class values for any test depends upon the degree of development that the children have achieved. For very easy tests or for very hard tests, the differences are small, but for average tests, the differences are large.

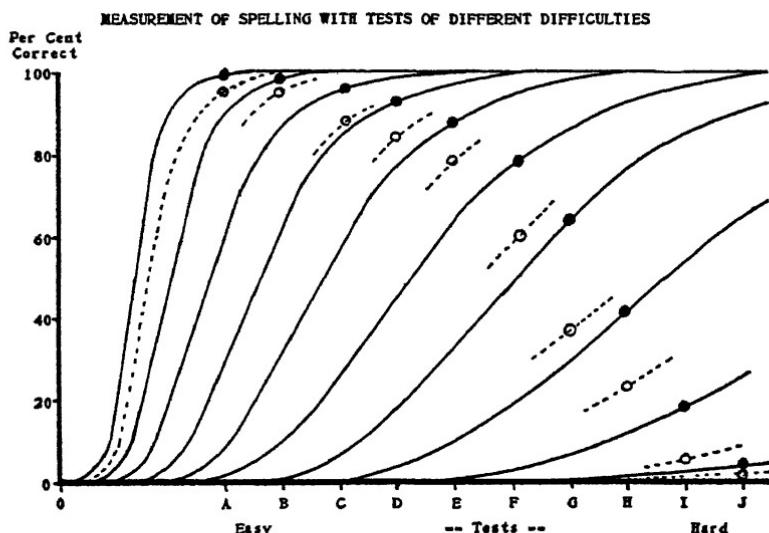


FIGURE 9.—THE CONCEPT OF MATURATION AS APPLIED TO TESTS OF DIFFERENT DEGREES OF DIFFICULTY

The Iowa scores and the class scores for each test are shown by small circles drawn at the proper percentages, with the Iowa scores in solid black. Through the Iowa scores have been drawn curves to indicate the course of maturation. The harder the test, the slower the rate of development. The corresponding curves for the class have been indicated by the dotted lines, except in the case of Test A, which has been drawn in full. Because of the form of the growth curve, the amount of separation between two scores depends upon the part of the curve on which the score falls. Near the upper or lower ends the differences are small. Near the middle the differences are large.

When such scores are expressed in isochrons, or maturation units, the uniformity of relationship is at once apparent.

#### ISOCHRONS CORRESPONDING TO PERCENTAGES OF DEVELOPMENT

Tests	A	B	C	D	E	F	G	H	I	J
Iowa	75.92	69.52	63.12	56.72	50.32	43.91	35.51	31.11	24.71	18.31
Class	62.24	60.12	51.21	47.54	43.92	36.78	30.19	26.24	19.35	15.31
Ratios	.819	.864	.812	.834	.872	.888	.804	.843	.783	.836
	Average ratio .836					A.D. $\pm$ .025				

In terms of maturation units the class's spelling performance is 83.6 percent of the Iowa standard, whether hard or easy tests are used. The use of the maturation concept and of units based upon the growth curve is rapidly bringing order out of the chaos in which educational measurement has been enmeshed for many years. Knowledge of the natural laws underlying the educational process, with consequent ability to predict and control, will be the ultimate outcome. Diagnosis is certain to take on new aspects of meaning and certainty.

There is not space in this chapter to present all the illustrations and implications which follow from acceptance of the concept of maturation as a basis of diagnosis, but one or two of them are so important that they must be mentioned.

First must be placed the value of cumulative records. We measure the same children year after year but we do not preserve the individual records, or if we do, we make no use of them. However, true norms of development can be obtained only from scores grouped in terms of equality in level of development. Why should we not all begin at once to study individual development curves instead of the misleading massed data with which our educational files are clogged?

Perhaps second in importance is the warning that to the degree the ideas presented in this chapter are true, conclusions from past studies are likely to be wrong. The complexity of factors determining any raw score makes it impossible to select from single measurements comparable groups for control experimentation. To establish *adequate* controls, it is necessary to match individuals *both* in achievement and in growth. Many similar changes in practices and interpretations will readily suggest themselves.

One final warning. In sketching briefly a complex situation, one tends to portray existing development as if all problems were solved and the Utopia of educational diagnosis had been reached. Unfortunately, such is not the case. The development of the maturation techniques is recent and imperfect. Many problems remain to be solved. The writer's claim is not that perfection has been achieved, but that the concepts and principles herein presented are based upon facts that are easily verifiable, and that they afford a new and very promising avenue of attack upon the whole problem of diagnosis. The suggestion of this chapter is merely that the new methods are worthy of trial and study by all who are interested in measuring the effect of specific factors and in fitting experiences specifically to the needs of individual children.



## CHAPTER XI

### THE PRINCIPLES OF DEVELOPMENTAL AND REMEDIAL INSTRUCTION

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#### I. SOURCES OF THE PRINCIPLES

The principles of developmental and remedial teaching here presented are generalizations that have grown out of the consideration of many case studies. To give clarity to these generalizations, two typical cases have been selected. One of them presented a relatively simple difficulty, easily corrected; the other was a more complicated case, presenting a wide variety of problems less easily solved.

##### Case I

The writer entered a fifth-grade room at the beginning of the arithmetic period. The teacher directed the pupils to take out their Curtis Practice Tests and prepare for the regular arithmetic drill. At the signal of the teacher all began their work. The teacher slowly walked up and down the aisles until she reached the seat of a youngster in the row nearest the wall. She stopped beside him, scolded him in a low tone, and struck him sharply on the head with her pencil. The child apparently resented this and was obviously quite disturbed by the total situation. The teacher proceeded to the front of the room and made this comment to the observer, "He is the laziest boy in the whole room. He simply refuses to try in his practice work." The teacher was clearly emphasizing the work in arithmetic and at the same time failing to give adequate consideration to other important outcomes of learning.

Suspecting that there was some sort of difficulty that should be diagnosed, the observer arranged to interview the boy.

The first step of the examiner was to analyze the record of the pupil's previous work. He was working on Card 2, Subtraction. His record showed that he had practiced on this card 45 times. His scores from day to day fluctuated erratically. On one day he would apparently attempt most of the examples but he would have less than half of them correct; on the next day he might try only a few but have all

of them correct. This picture the examiner recognized at once as typical of the performance of pupils who have a serious underlying difficulty that must be corrected before improvement is possible.

The next step of the examiner was to secure the coöperation of the pupil. This was done by discussing various matters sympathetically with him. At first the boy was timid and uncommunicative, and revealed some unwholesome attitudes. When good rapport was established, the examiner asked the pupil to work several examples aloud for him, so that he could observe his mental processes in working them. The first three examples were solved quickly and correctly. When the fourth example was reached, the boy said: "I always miss examples like this one and I don't know why." The example differed from the first three in that one digit of the minuend was smaller than the related digit in the subtrahend. The boy simply did not know how to proceed when borrowing was necessary. He worked every example involving borrowing incorrectly. He knew the source of his difficulty, but did not know how to correct it. Here was a rather obvious difficulty that his teacher had not detected. She had apparently assumed that all that was necessary was to assign additional practice.

The correction of this specific difficulty was simple. Through the use of a few carefully selected illustrations, the boy was taught the correct procedure in a few minutes. He was obviously delighted to discover how simple the procedure was. The examiner gave him some practice on the step until satisfied that the boy knew the method. The teacher was greatly surprised when told the results of the examination and her attitude toward the boy was completely changed. With a little additional help by the teacher, he passed the subtraction practice test on the second trial and proceeded to the next card, a much happier youngster. One wonders what educational and emotional maladjustments might have developed if this difficulty had not been corrected.

### Case II

The second case concerns a fifth-grade boy of superior mental ability (I.Q. 145). The first persons who observed any evidence of difficulty were his parents. Shortly after he was promoted to the fifth grade, he began to stutter. He had stuttered slightly before, but now the condition appeared to be greatly aggravated. One day, in conversation with his mother, he said: "I don't recite any more in school because I stutter so badly." On another day he said somewhat bitterly that both his teacher and his roommates had laughed at him that morning when he tried to recite. His parents were considerably disturbed by the emotional effects of this speech defect. Furthermore,

## *PRINCIPLES OF REMEDIAL INSTRUCTION*

the marks on the boy's first report card indicated that he was doing unsatisfactory work in several subjects, although his work in the fourth grade had been of superior merit.

The parents then undertook to determine the causes of the difficulty. An interview with the teacher, a very sympathetic individual, showed that the boy was balking on assignments requiring any considerable amount of writing. Some assignments he would not even attempt; others he would begin but not complete. In his arithmetic work he refused to work what he called "foolish" long division examples, although his real objection was probably the amount of writing required. Instead of doing his written work, he read books or sat quietly in his seat. The teacher also reported that his penmanship was very inferior. It appeared that the teacher insisted on neat written work and required the pupils to re-write work of inferior quality. This the boy resented. Most teachers would have been tempted to punish him for his bad attitude. Fortunately this teacher did not; she appreciated the fact that he presented a problem, and she offered to coöperate with the parents in every way possible to remedy the maladjustment.

To the parents the fact that difficulty was present in both oral and written speech suggested a possible source of the maladjustment. One speech clinic suggested that the difficulty was probably only a temporary one and might quickly be outgrown. So for a time nothing further was done. However, the speech difficulty seemed to increase in severity. One of the parents had read of the corrective work being done with speech defectives at the University of Minnesota, where remarkable improvement in oral speech resulted from changing the hand used by stutterers in writing from right to left. The parents took the boy to the University Speech Clinic. Dr. Brynglson, the head of the clinic, found the boy normal physically and mentally. In reviewing the history of the case, he considered the question of lateral dominance of vision and handedness. The parents recalled clear instances of ambidexterity in the manipulation of toys and other objects. The father was ambidextrous to a high degree. Tests of lateral dominance showed clearly that the boy was left-handed although he was right-eyed. He also revealed marked ability in mirror writing with his left hand, whereas mirror writing with his right hand was completely blocked.

Dr. Brynglson suggested that the boy develop his left hand to the fullest possible extent and at the same time decrease the use of the right hand. He explained the theory of dominance to the boy, who readily agreed to coöperate.

A series of developmental and corrective measures was outlined.

The boy was to take a systematic course in writing with his left hand. He was given a group of exercises and games requiring the use of his left hand. Corrective speech exercises were to be practiced. To reduce his self-consciousness, he was told to practice stuttering and actually did so. He was told to discontinue his piano lessons, because they required the use of both hands. He was to do no writing in school for several weeks. His teacher arranged his work in such a way that any necessary writing could be done at home. Under no circumstances was he to use the pen for at least a year, and no emphasis was to be placed on high standards of writing. He was to get ample sleep and outdoor exercise. Everything possible was to be done to relieve any tension or strain in the school situation and in the home.

The results of this remedial program exceeded all expectations. The boy coöperated very faithfully. He carried out his part of the routine meticulously. The teacher and the parents also coöperated wholeheartedly. In a short time there was a marked decrease in stuttering. The boy began to contribute to class discussions; his interest in written work increased; his whole mental attitude toward the school underwent a marked change for the better. Needless to say, this boy, who is now in Grade VI, has practically overcome a serious difficulty that might have had a most unwholesome influence on the development of his total personality. It is not possible to state what the precise remedy was. The solution grew out of the application of many different measures, any one of which might have been the decisive element. It is likewise possible that the omission of any one of them might have destroyed the effectiveness of the entire program.

## II. BASIC PRINCIPLES

In each of these cases there was clear evidence of some difficulty that interfered with normal growth. The total situation was canvassed to determine factors that might contribute to the maladjustment. In both cases the examiner dealt with the whole personality of the individual involved. Special consideration was given to emotional and social elements of the situation. The wholehearted coöperation of the learner was secured. In one case the specific difficulty was readily diagnosed and was corrected by simple measures; in the other case a more complex procedure, based on a less exact diagnosis, was followed, and led to apparent remediation. In both cases the remedial program was integrated with the regular classroom situation. In both cases the remedial program grew out of a body of experiences with individuals who had had similar difficulties.

The following principles, basic in developmental and remedial in-

struction, represent generalizations derived from the consideration of numerous case studies.

1. *The growth of the individual should be the primary consideration.* If the teacher focuses his attention on the learner rather than on a particular subject, such as reading, and approaches the problem from the point of view of discovering why this particular learner is not making satisfactory progress, it is more likely that a comprehensive basis of developmental and remedial treatment will be established. This procedure of focusing on the learner rather than on a subject insures consideration of all aspects of the learner's individuality, including his physical development, his mental ability, his scholarship, his social attitudes, his emotions, his interests, and his special aptitudes. All these aspects of personality bear more or less directly on any general ability, such as reading. If attention is focused on reading, rather than on the learner, it is likely that the teacher may overlook many aspects of personality of much greater significance than the relatively narrow ability to read.

2. *In order that the educative process may be directed as efficiently as possible, it is necessary that all the objectives of instruction be clearly formulated, so that no essential one is overlooked.* This is necessary regardless of the type of curriculum the school offers, or the basic philosophy of education of the teaching staff, be it conservative or liberal, traditional or progressive. Techniques for determining the extent to which these objectives are being achieved must be developed and systematically applied. By experimental methods the school must discover the types of learning experiences at the various levels of maturity by which these objectives can most adequately be achieved. This approach will involve a critical study of the learning process and the experimental evaluation and improvement of methods and materials of instruction in the light of the facts that are discovered from time to time concerning the conditions under which learning most effectively takes place. Tests of achievement show that pupils of superior ability sometimes progress at levels considerably below what should be expected of individuals of their aptitude. The school faces the problem of providing learning experiences that will raise their performance to a level consistent with their potential ability. At the same time the school must make every effort to develop pupils of low capacity to the maximum that their native endowment will permit.

3. *Effective developmental and remedial instruction must give due consideration to the relative importance of objectives.* At present there

are reasonably valid techniques for diagnosing difficulties and deficiencies in specific skills and abilities in the tool subjects. Care should be taken not to devote so much time to remedial treatment in these relatively limited fields that pupils are deprived of educative opportunities for attaining important, but less specific, outcomes such as attitudes, social insight, interests, and appreciations. In their efforts to improve the skills, especially of duller pupils, teachers sometimes use the time allotted to literature, music, art, and similar subjects for additional practice on the skills, thus depriving these pupils of valuable cultural experiences. Other teachers place so much stress on creative work in music, art, and dramatics that they have little time left for creative work in spelling, formal language, arithmetic, and other subjects.

*4. Remedial instruction should be regarded as an integral part of any well-rounded program of education.* The more effectively the total program of education is organized, the less need there will be for remedial instruction. When the curriculum is vital to the learner, when methods of teaching are skillful, and when instructional materials are efficiently organized and adequate, learning in school proceeds with a minimum of difficulty. When difficulties do arise, they should be corrected at once by the regular teacher. Many of these difficulties are transient in character and are of little significance. When face to face with a case that presents unusual learning difficulty, the teacher should make a systematic analysis of contributory factors, so as to diagnose the difficulty and take steps to bring about an improvement. The teacher who lacks the essential technical skills should refer problem cases to specialists for analysis. As a general rule, except in unusual problem cases, the remedial instruction should be done by the regular teacher, who is in intimate contact with the learner, not by some other person who has little direct association with the individual. It is important that one person should be responsible for the treatment of any individual child.

*5. Treatment must begin with a specific attack on particular difficulties at the present level of the learner.* It is necessary to identify the difficulty rather than the symptoms, even though the attack on symptoms sometimes produces improvement. The more specific and definite the diagnosis, the more intelligently can the remedial work be planned. It is futile, for example, to attempt to improve the work of a pupil scoring low in a long division test by practicing with long division examples, when the source of the difficulty is weakness in the subtraction process involved. Similarly, practice exercises to develop rhythmic

eye movements in reading are useless when inability to coordinate the eyes is the basic difficulty. Pupils in Grade IV who are deficient in reading ability should not be assigned fourth-grade material to read. They should be given reading materials adapted to their particular level of ability. In general, the rule applies that a particular difficulty is overcome by attacking that particular difficulty directly. There is ample evidence that well-directed practice on a specific skill yields large returns. The essential thing is that the root of the difficulty must be the spot where the initial attack is made.

6. *In planning the details of a remedial program the teacher must select procedures that are as far as possible of demonstrated value.* The sciences related to education are the most fruitful sources of such information. From psychology the teacher can secure suggestions as to how to develop effective methods of learning. From psychiatry the teacher can secure suggestions as to methods of correcting faulty emotional reactions and unwholesome traits of personality. Sociology gives many suggestions as to methods of eliminating unwholesome environmental influences. Neurology and medicine offer many suggestions for remedying physical handicaps. Experimental education has established the value of many specific types of procedures for improving ability in the tool subjects.

7. *One of the first steps in a remedial program should be the correction of physical handicaps.* When the physical examination reveals visual or auditory defects, glandular malfunctioning, malnutrition, fatigue, and so forth, effective learning is impossible. When for financial reasons the family cannot take steps to correct these deficiencies, the aid of public agencies must be invoked. The correction of defects and the upbuilding of weaknesses are both essential elements in any remedial program founded on the belief that in all cases the primary consideration is the well-rounded growth of the learner. (See Chapter I.)

8. *Special consideration must be given to environmental factors, both in and out of school, that contribute to the maladjustment.* If there is a faulty personal relationship between teacher and pupil, this must be corrected. It may be necessary to shift the pupil to another class. Curricular readjustments may be advisable. If there are strained conditions in the home, an effort must be made to alleviate them. If the pupil is living in an unwholesome social environment, it may be necessary to remove him from the immediate locality before improvement is possible. The wholehearted coöperation of those in direct contact with the case must be secured. (See Chapter VI.)

9. *When the learner has a faulty mental attitude toward the school or toward a particular subject, steps must be taken to correct it.* These faulty attitudes may range from complete indifference to extreme dislike for the subject. They are the result of many factors, such as failure to profit from the class work, inaptitude, faulty methods and materials of instruction, bad rapport between teacher and pupil, and unfavorable environmental conditions. The remedy consists in part in discovering what the contributory causes are and alleviating them, in part in taking positive steps to substitute good attitudes for bad ones.

10. *Remedial teaching must proceed on a tentative basis.* Because there are few known specific remedies for learning difficulties, the teacher is called upon to devise remedial programs adapted to particular cases. The details of these programs may grow out of the teacher's previous experience with similar cases, may be based on reports of remedial work in educational literature, or may be mere best guesses. The effectiveness of this work will depend on the extent to which the teacher has made adequate allowance for all factors in the situation and the skill with which the measures are applied. Because of the difficulty of taking into consideration these many factors as they affect different individuals, the teacher must be prepared at any time to alter the remedial program. If there appears to be little improvement, a new attack on the problem must be made. This program of varied attack must be continued until the solution is found.

11. *The teacher must take cognizance of individual differences in establishing the goals of developmental and remedial instruction.* It is probably true that no two learners have exactly the same difficulties. With respect to any single trait they do not begin at the same level, nor at any given time is the trait developed to the same extent in different individuals. They do not all learn by the same kinds of experiences. In some cases a small absolute growth represents a relatively large growth for the individual concerned. The child of inferior ability should be assigned well-graded tasks that he can master. His goals must be adjusted to his capacity for growth. It is essential that from the beginning the inferior pupil see his improvement, even though it may take place in very small increments. On the other hand, the learner who has superior ability should be led to set much higher goals, standards that individuals of his greater aptitude should strive to achieve. Hence the importance of using instructional materials and methods adapted to variations in rates of growth.

12. *Effective remedial instruction requires a large measure of self-*

*diagnosis by the learner, a self-initiated attack by the learner on the solution of his learning problems, and the selection by the learner of goals to be achieved.* Self-diagnosis by the learner with the help of the teacher leads to insight into the nature of his difficulty. A true appreciation of the significance of the difficulty and the awareness of possible methods of removing it contribute effectively to a purposeful attack by the learner. The teacher can help the pupil to select the particular aspects of the situation that should first be attacked. The teacher can also assist the pupil to evaluate the success of his efforts and, when necessary, can lead him to select more effective methods.

When the school provides the opportunity for the pupil to make such an intelligent attack on the solution of his learning difficulties, direct training of a valuable social kind is being given in the use of methods that should be employed to solve problems encountered in life outside the school.

13. *Pupils of superior and inferior mental ability who encounter learning difficulties require different types of instruction.* Superior pupils are much more able to generalize than inferior pupils. They can analyze their difficulties much more easily. Superior pupils seem able in most cases to devise methods of work that are effective without the direct help of the teacher, whereas inferior pupils must in most cases be given careful instruction in efficient study habits. Pupils of superior ability usually have a richer background of information and experiences on which to draw; they can also learn more rapidly and, because of their greater ability to generalize, do not require learning units so carefully graded as seem necessary for pupils of inferior ability.

14. *A cumulative record should always be kept of the diagnosis and of the remedial work.* Such a record makes possible a systematic review of the steps that have been taken and the location of other corrective steps that may be taken. It is invaluable for the next teacher when the pupil is promoted. A record of this kind is also a mine of valuable information concerning methods and materials to be used with other cases. An analysis of such records for a large number of cases will reveal many important facts about the learning process itself. Successful methods of remedial treatment for common difficulties can also be located and subsequently incorporated in instructional materials.

15. *There should be a check upon the validity of the remedial work.* In some cases there appears improvement that is incorrectly ascribed to a particular kind of remedial work. Its validity should be checked by using the same remedial treatment with other cases having the same

difficulty. In other cases it may appear that a permanent improvement has taken place, when, as a matter of fact, the basic underlying factor has not been removed. To make certain that real progress has been made, a systematic plan of reviewing all problem cases should be included in any program of remedial instruction.



### *SECTION III*

## **DIAGNOSIS AND REMEDIAL INSTRUCTION RELATED TO THE UNIQUE CONTRIBU- TIONS OF VARIOUS FIELDS OF INSTRUCTION**

In Section II were described and evaluated various techniques of diagnosis. Criteria for evaluating any technique were given. The general principles underlying competent diagnosis and remedial instruction were included.

In Section III the various techniques are applied to specific fields of instruction. The material is divided into five chapters, dealing with reading, language including spelling, writing and composition, social studies, science, and arithmetic. These subjects form the backbone of the elementary-school curriculum and embody important sections of education at higher levels. While numerous illustrations are drawn from the field of research in elementary education, a definite effort has been made to show the applications of the procedures suggested at all levels of schooling.

Each chapter is a complete treatment of one subject. The general outline of each chapter contains the following major heads: the objectives of the field under consideration, methods of determining the degree to which these objectives are being achieved, factors associated with faulty learning, techniques for locating factors interfering with successful learning, and suggestions for overcoming faults revealed by diagnosis.

Because of limitations of space the discussion is not as specific as may be desired. However, ample references to other material of a more definite kind are given in the footnotes. In such fields as reading and arithmetic it has been possible to make very concrete suggestions for remedial treatment based on careful research. In other fields, such as science and the social studies, such experimentally evaluated information is not available. The authors realize the weaknesses of their treatments of this phase of their chapters; they hope that the evident shortcomings of research in this field will stimulate studies to determine the effectiveness of various types of remedial treatment.

## CHAPTER XII

### DIAGNOSIS AND TREATMENT OF READING DISABILITIES

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#### INTRODUCTORY

One of the most important outcomes of the testing movement has been the discovery of individual differences in children. The problem now is to discover why these differences exist and to adapt instruction in the schools to fit the widely differing needs of the children. In the field of reading especially, wide variations have been found among the abilities of children of the same ages. Many boys and girls quickly and easily learn to read, while others in the same room, receiving presumably the same instruction, fail to make normal progress. The explanatory and causative factors in reading difficulties have interested research workers not only in education but also in allied fields such as psychology, mental hygiene, physiology, and neurology.

#### I. FREQUENCY OF READING DIFFICULTIES

An estimate has been made that twelve percent of the school population is decidedly retarded in reading.<sup>2</sup> This percentage means that a school of four hundred children would contain forty or fifty cases. At the Child Guidance Center in Pittsburgh, reading disability is a factor in approximately twenty-one percent of the cases referred.

#### II. EFFECT OF READING DISABILITIES ON SOCIAL AND VOCATIONAL ADJUSTMENT

Reading disability affects not only a child's scholastic progress, but also his social, vocational, and economic adjustment. Illiteracy is regarded as a social breach, and the person who cannot read feels called upon to explain his inadequacy. Conflicting attitudes and emotions arise from his failure to fit into the social pattern. Illiteracy also

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<sup>1</sup> Also research psychologist under grant of the Buhl Foundation.

<sup>2</sup> Marion Monroe. *Children Who Cannot Read* (U. of Chicago Press, 1932), p. 15.

handicaps vocational choice and, consequently, economic success. A generation or so ago, the unschooled but shrewd street urchin could often work his way up to an industrial leadership. Today, chances for such success are more limited. The person of meager school achievement has more strenuous competition than formerly and far greater emotional reactions to his lack of education.

### III. GENERAL OBJECTIVES OF INSTRUCTION IN READING

In order to recognize the causes of reading failures, one must first consider the objectives of teaching reading. Instruction in a subject is guided by the philosophy underlying that subject's place in the curriculum. There has been an increasing recognition of the part played by reading in social, economic, and political life. The enormous yearly output of books and journals necessitates the rapid reading and quick comprehension of large amounts of material if one is to keep informed in even a single field of interest. As society demands an increasingly superior attainment in reading, educators in turn demand superior achievements of children at the various grade levels.

The major objectives of reading<sup>1</sup> are usually considered to be the following: (1) *to provide rich and varied experience through reading*, (2) *to develop strong motives and permanent interests in reading*, and (3) *to develop economical and effective reading habits and skills*.

#### 1. Extending Experience

Reading extends an individual's experience beyond the realm of actual life. The modern teacher attempts to select reading materials that will give her pupils opportunity for such valuable experiences.

#### 2. Developing Interests

Reading may provide a wholesome means of recreation and use of leisure time. The desire to read should extend beyond school. A teacher who wishes to obtain a measure of her pupils' spontaneous drive toward reading may give standardized reading tests at the close of school in the spring and repeat the tests at the opening of school in the autumn. She will notice several discrepancies between the spring and autumn scores. Those children who have developed interest and drive toward reading and have read spontaneously often show the effect of the summer's practice in improved test scores. Those whose reading interests

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<sup>1</sup> *The Twenty-Fourth Yearbook* of this Society.

stop with the closing of school may show, on the other hand, a slight decrease in scores owing to their lack of practice during several months.

Not only does the teacher strive to develop interest and drive toward reading, but also judgment and appreciation in the selection of books. She attempts to guide the children in their choice of reading in order that they may learn to enjoy profitable, thoughtful, worth-while materials and avoid sensational and inferior materials. It is difficult to find a satisfactory measure of appreciation since tastes vary at different ages and even among adult critics themselves. A method of scaling literary passages and measuring literary appreciation devised by Carroll<sup>1</sup> will illustrate recent experimental work in this field.

He arranged a test which consisted of samples of excellent, good, poor, and inferior prose, selected from recognized sources of merit such as Tolstoi and the *Atlantic Monthly*, and from poorer sources such as *Wild West Weekly*, *True Experiences*, and the like. Some selections were deliberately mutilated to make bad prose. Four paragraphs from best to worst were placed in mixed order. The children were asked to read and choose the best paragraph in each set of four. In order to check the validity of the scale, sixty-five judges rated the selections in terms of literary merit. The judges consisted of critics; authors; university and high-school teachers of English. The agreement of these judges was taken as evidence of consistent differences in the literary quality of these passages. Children taking the test made quantitatively high or low scores according to their ability to distinguish the "good" passages from the "bad."

### 3. Developing Skills

Children, like adults, tend to avoid subjects in which they fail. To develop proper attitudes, interests, and appreciations in reading, it is necessary to develop effective reading skills. A child who reads with many errors may so bungle a passage of excellent literary style as to fail completely to catch either its meaning or its beauty. Teachers of reading should analyze thoroughly the processes involved in each reading skill and the steps by which the skill may be acquired. Although we should like to be able to teach without awareness of mechanics and concentrate attention wholly upon the uses of reading, we can do so successfully only when the reading skills are developed in easy, natural steps, taken without difficulty. Instead of ignoring the mechanics of reading

<sup>1</sup> Herbert A. Carroll. "A standardized test of prose appreciation." *Journal of Educational Psychology*, Sept., 1932.

for the sake of content and appreciation, we should, for their sake, study more carefully the difficulties that arise in the acquisition of any reading skill and perfect our methods of developing it.

Effective reading skills may be classified as follows:<sup>1</sup>

### *I. Skills Involved in Recreational Reading*

1. Oral reading skills are essential in reading for social recreation, dramatics, and personal enjoyment.

*a.* The child should be able to take an effective attitude toward the audience, achieving emotional poise while reading and commanding interest and attention.

*b.* He should be able to read aloud accurately, with quick word-recognition, without stumbling or hesitation; he should have mastered adequate mechanics of oral reading for his age or for the passage he has chosen to read.

*c.* He should have knowledge of the vocabulary and sentence structure of the passage.

*d.* He should be able to interpret the passage properly, phrasing accurately, recognizing periods and punctuation marks. He should have sufficient 'eye-voice span' to permit expressive and appreciative inflection.

*e.* He should be able to articulate accurately, with controlled breathing, pleasant tone quality, and volume of voice adapted to the size and needs of his audience.

2. Silent reading skills are essential in reading for enjoying books and articles.

*a.* The child should be able to recognize words, phrases, and sentences accurately and quickly; his achievements in the mechanics of silent reading should be adequate for his age or for the passage he has chosen to read. He should have accurate motor control of eye movements, with a perceptual span of several words per fixation.

*b.* He should be able to comprehend the text, its vocabulary and sentence structure.

*c.* He should be able to appreciate the passage, throwing himself into the story or article, developing the imagery suggested, evaluating the contents in terms of emotional and intellectual satisfactions, and noting agreeable or distinctive points of style.

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<sup>1</sup> Ernest Horn. "The objectives of reading as a guide to remedial and prophylactic work." *Yearbook No. 2, Department of Elementary-School Principals, Nat. Educ. Assoc.* 1923, pp. 287-296.

*II Skills Involved in Work-Type Reading*

1. Oral reading skills are essential for informing others, giving announcements, reading minutes or news items, and proving points.
  - a. The child should be able to take an effective attitude toward his audience, in order to communicate information clearly, distinctly, and forcefully.
  - b. He should have accurate mechanics of oral reading appropriate for his grade or for the passage to be read. He should be able to read aloud with proper interpretation, phrasing, and inflection.
  - c. He should be able to condense or cut the article to give salient points when time does not permit full reading.
2. Silent reading skills are essential for the purposes of getting information, solving problems, understanding situations, verifying facts, making judgments, satisfying curiosity, and preparing assignments.
  - a. The child should have mastered the mechanics of silent reading with appropriate skill for the passage to be read.
  - b. He should be able to skim material quickly, using tables of contents, indexes, library cards, and readers' guides suitable to his age. He should be able to locate specific material easily.
  - c. He should be able to understand meanings. He should be able to find the central thought of the passage or obtain precise details as needed. He should know how to use the dictionary and encyclopaedia, or how to find supplementary material to explain passages not fully understood.
  - d. He should be able to evaluate material in terms of information on the topic obtained from other writers.
  - e. He should be able to prepare the material for recall by making summaries, outlines, abstracts, and reviews.

**IV. TWO STEPS IN DIAGNOSTIC PROCEDURE**

Why do certain individuals and occasionally entire classes of children fail to acquire these desired reading attitudes and skills? In discovering the causes of reading failures, two steps in diagnostic procedure may be followed: first, the analysis of weaknesses in teaching methods; second, the analysis of individual difficulties in learning.

In the first kind of diagnosis, the teacher attempts to evaluate the outcomes of her instruction and to determine the extent to which her methods have been successful. She may do this subjectively, by observation and analysis, or objectively, by use of standardized tests. Pres-

ent-day tests are inadequate for measuring all the aims of reading. Certain abilities, however, oral reading, silent reading, rate, comprehension, reading for specific purposes, such as getting the central thought or specific details, judging literary merit, and so on, may be measured with fair degrees of reliability and validity. Class medians may be compared with standards for age or grade. If the medians are high in all types of reading, the teacher may reason that her methods have been wisely chosen so far as the group is concerned. If, however, she finds that one particular skill falls below the level of the others, she may redirect her efforts toward developing this skill. One class, for example, may be relatively high in oral reading but low in rate of silent reading; another class may be high in rate but low in accuracy of comprehension. In the one class, exercises for developing speed are indicated; in the other, for developing greater accuracy.

The second kind of diagnosis necessitates individual study. The median level of a class may be high in every type of reading; the group as a whole may be interested and appreciative, and yet certain individuals may fall far below class standards. Individual diagnoses of the difficulties of these children may reveal the causes of their failure. Such diagnosis requires careful and thorough exploration of each child's intellectual capacity, sensory and motor make-up, and emotional and personal traits that may be affecting ability to learn. The problem of remedial instruction is to find methods of learning that will overcome the difficulties. Often teachers are reluctant to modify for an individual child a method that is bringing good group results. Since the method is good, judged by group standards, the teacher cannot help feeling that the child is to blame for not profiting by it as the good readers have done. If, however, the teacher can find a specific reason for his failure to adapt, she may also find a way to individualize her instruction to meet his needs and simultaneously continue the methods suited to the needs of the group.

#### V. THE CAUSES OF READING DIFFICULTIES

Learning to read is such a complex process that it may be affected by many different factors. Reading necessitates certain sensory abilities (to discriminate the pattern of letters and words seen and to discriminate the sounds of words); certain motor abilities (to follow a line, to move the eyes across the page and return accurately to the beginning of the next line); certain linguistic abilities (to understand and use speech); various intellectual abilities (reasoning, judgment, com-

parison, and evaluation); also emotional and esthetic abilities (appreciation and liking for literature).

Learning to read is a process that follows the general laws of learning. The experimental work in learning indicates the importance of such items as age, intelligence, length of lesson, time, spacing of lessons, motivation, methods of presentation, previous learning, and the like. Because reading may be influenced by so many diverse factors, an analysis of any person's failure to learn to read must necessarily take into consideration the history of the individual, his age, intelligence, physical condition (particularly with respect to sensory and motor deviations), emotional drives and interests, language abilities, and a specific analysis of any weakness in the reading skills.

In the following discussion of the factors that affect reading, an attempt has been made to estimate the frequency of each factor upon which data are available. These data are taken from the records of children who have received complete clinical study either at the Institute for Juvenile Research, Chicago, or at the Child Guidance Center, Pittsburgh. Each percentage is based on at least one hundred cases, although for some items, data are available for more than four hundred cases. The percentages give an idea of the frequency with which certain problems are met among poor readers. The sampling of poor readers brought to clinics is probably fairly representative. Since more than one factor is often present in a single case, the sum of the percentages of the various factors is more than one hundred.

#### A. PERCEPTUAL DIFFICULTIES IN READING

##### 1. Visual Difficulties in Reading

a. *Poor vision is sometimes a cause of reading disability.* About twenty-three percent of poor readers<sup>1</sup> are found to have visual defects that necessitate prescription of glasses. Of course, many good readers also need glasses. It is a commonsense procedure to correct visual defects for all children who need such correction. The prescribing of glasses does not, however, take the place of remedial instruction. After the child has been fitted with glasses his teacher sometimes expects him to catch up immediately with his class. Often such a child has fallen far below grade; he has developed habits of guessing and of faulty word perception before normal sight was established, so that he must have special help to eliminate these habits. If sight cannot be corrected

<sup>1</sup> Marion Monroe. *Loc. cit.*, p. 80.

suitably for normal reading, the child should be referred to a sight-saving class where he will have the benefit of large print and other materials specially adapted for poor vision.

*b. Defects in peripheral vision may be a cause of inability to read.* Not only must a child be able to see distinctly in the center of the visual field, but he must also be able to see for some distance on either side of the point that he is fixating. Some people, in reading a line of text, can at one fixation grasp several words, while others may have to fixate each word and, in rare cases, each letter. In some types of visual defects, peripheral vision is so affected that the child has great difficulty in developing a normal span of reading. A child that suffers from restricted or impaired visual fields usually finds reading extremely difficult, and if he has learned to read at all, does so very slowly, with much losing of the place, line-skipping, and spelling of words. Between one and two percent of the children that have reading disabilities and are brought for clinical study show this type of visual defect. Although this percentage is low, the necessity of a proper diagnosis is important.

*c. Difficulty in recognizing the orientation of forms is a frequent factor in poor reading.* About fifty percent of children with reading disability show excessive reversals in their reading errors.<sup>1</sup> Because considerable attention has lately been given to reversals in reading, it is well to give the present status of this controversial subject. The following factual observations have been made regarding reversals: (1) reversals occur normally among the majority of children learning to read; (2) reversals are more frequent in the lower grades and gradually decrease with age and with reading achievement; (3) most children spontaneously eliminate their reversals as they eliminate other types of reading errors; (4) some children have considerable difficulty in eliminating reversals unless special help is given toward that end; (5) poor readers tend to make more reversals than do good readers of the same reading-grade level; (6) poor readers tend to have more regressive eye movements than do good readers; (7) poor readers tend to have a higher incidence of left-eye preference than do good readers.

The interpretation of these data has led to several theories as to the nature of reversals, which may be summarized as follows:

1. Reversals have been attributed to a confusion in cerebral domi-

<sup>1</sup> Fifty percent of reading disability cases exceed the 75th percentile score in reversals made by unselected children in a test now being standardized at the Child Guidance Center.

nance, in which the brain fails to work consistently from either the right or left hemisphere.<sup>1</sup>

2. Reversals have been attributed to difficulty in developing rightward eye movements on the part of some left-eyed children. Left-eye preference may predispose some children toward leftward movements and act as an interference in establishing rightward movements. About forty-three percent of reading disability cases have left-eye preference, compared with twenty-six percent of good readers.<sup>2</sup>

3. Reversals have been attributed to inappropriate techniques in word perception.<sup>3</sup> Beginners in reading often look back and forth over unfamiliar words. In such word study, regressive movements occur and may result in reversals. If beginning reading contains too difficult a vocabulary, inappropriate habits of word study, with their accompanying reversals, are increased in frequency and may persist.

4. Visual defects may cause a child to make a too prolonged study of words and result in regressive movements and reversals.

5. Poor motor control may result in reversals.<sup>4</sup> Many children who have birth injuries, chorea, or other physical ailments that result in lack of precision or unsteadiness in motor adjustments show reversal tendencies. Such children are sometimes unable to follow a line of words with the eyes or even with the fingers. Naturally, in losing the place and looking back to find it, reversals occur. Left-handed children who are forced to use the right hand may find their motor habits disrupted, with resulting loss of precision and of steadiness of control.

6. Teaching methods may be inappropriate for helping children to learn the direction of reading. Early presentation of phrases and words as units without sufficient indication of the sequence of words within the phrase or of sounds within the word may fail to assist children in eliminating reversals. Some teachers are so eager to prevent the development of what they regard as undesirable habits of finger-pointing, that they frequently prevent the child from assisting himself to establish the right direction of movement.

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<sup>1</sup> Samuel T. Orton. "An impediment in learning to read, a neurological explanation of the reading disability." *School and Society*, Sept., 1928, pp. 286-290.

<sup>2</sup> Marion Monroe. *Loc. cit.*, p. 91.

<sup>3</sup> Arthur I. Gates. *Reversal Tendencies in Reading* (Bureau of Publications, Teacher's College, Columbia University, 1933).

Guy Thomas Buswell. *Fundamental Reading Habits* (Supplementary Educational Monographs, Vol. 21, June, 1922, University of Chicago, 1922).

<sup>4</sup> Marion Monroe. *Loc. cit.*, p. 127.

7. Poor auditory memory may result in reversals.<sup>1</sup> Some children successfully give the sounds or syllables in a word, but through poor auditory memory, fail to reproduce the word correctly. These faulty blends are frequently reversed in character. Many preschool children speak of a *flutterby*, for a *butterfly*, or *goshals* for *goloshes*. We all know how easy it is to confuse some such expression as *a jot and a tittle*, making it *a jit and a tottle* or *a tot and a jittle*, etc., until we are thoroughly bewildered. Reversals are frequent in the Stanford-Binet tests for digits-forward. Reversals are common, too, when one remembers a telephone number repeated orally. There is plenty of evidence that reversals occur in recalling the temporal sequence of sounds as well as the visual sequence of words and letters.

The tendency to make reversals is probably not a simple phenomenon with a single explanatory cause, but may result from a variety of causes. The remedial treatment for reversals, regardless of the theory accepted, is based on simplification of reading material to the point where the child can read as accurately as possible, and practice with exercises stressing direction in which hand and eye movements are coöordinated, through tracing words, underlining text while reading, finger-pointing, and the like.

## 2. Auditory Difficulties in Reading

a. *Poor auditory discrimination and poor auditory memory are sometimes causes of reading disability.* About forty-two percent<sup>2</sup> of the poor readers have great difficulty in sound discrimination. Consonants that are nearly alike are frequently confused, such as *wh-w*, *ch-sh*, *t-d*, *p-b*, or the short vowel sounds of *e-i*, *a-e*, *o-u*, and so on. Words almost alike in sound are confused, as *bit-bet-bat*, *bud-but*, *ship-chip*, etc. Poor auditory discrimination is frequently observed in children's definitions of words. This confusion of sounds may prevent the child from recalling words exactly and from reacting to their meaning accurately. One child hesitated over the word *large* and said, "I ought to know that word. We had it at school. It is the next to the last word in the bottom line on page ten. I can't remember what it is, but I think it is something big." This child had good visual memory for the word; he recognized it readily, discriminated it accurately, associated its meaning, but could not recall the auditory symbol. In the formation

<sup>1</sup> Marion Monroe. *Loc. cit.*, p. 96.

<sup>2</sup> Forty-two percent of reading disability cases fall below the 25th percentile score of unselected children in distinguishing sounds.

of such associations a certain amount of precision in both visual and auditory discrimination is required, as well as a sufficient number of repetitions to fix the association.

Five causes of poor auditory discrimination may be listed as follows:

1. Partial deafness naturally interferes with sound discrimination. About two percent of reading disability cases are noticeably deaf or hard of hearing, so that a louder voice than ordinary must be used in speaking to them.

2. Children not noticeably hard of hearing may have difficulty for a certain range of pitches. For example, partial deafness to high pitches would not prevent a child from hearing ordinary tones of voice, but might interfere with his hearing certain qualities in the overtones. These slight qualitative differences in tone may be important in appreciating some of the speech sounds, particularly of the vowels. It is probable that many children who have difficulty in distinguishing sounds are handicapped by such partial deafness. Although careful audiometer study has not been made in large groups of readers, the results of such study in individual cases have been illuminating.

3. Faulty articulation may prevent a child from distinguishing the sounds of words. He becomes so accustomed to his own pronunciation that he does not improve his speech by hearing words correctly spoken. "Say cat," said the examiner to a little boy. "I'm saying tat," he replied, surprised at her stupidity.

4. Foreign accent, dialect, or mispronunciations of words heard by the child at home may be a source of confusion in discriminating sounds.

5. Inadequate vocabulary may prevent the child from identifying the sounds of words accurately. A child who has a small speaking vocabulary may be at a loss to know what word the teacher has said. He would be still more at a loss in attempting to associate the word with a printed symbol.

b. *Poor ability in sound-blending is often a cause of reading disability.* Not only must the child identify the sounds of words accurately, but he must be able also to blend the sounds into words if he is to be able to utilize phonetics in reading, to work out longer words by syllables, or to identify a smaller word within a larger word. Some children can sound out the word *b-i-g*, for example, but cannot build the word from the sounds. Some children can give the syllables *con-sti-tu-tion*, but cannot put the syllables together in pronouncing the word. About fifty-two percent of reading disability cases have difficulty in

sound-blending, and therein fall below the 25th percentile score of unselected children.

#### B. MOTOR DIFFICULTIES IN READING

The process of reading requires not only sensory discriminations, but also motor adjustments. Children who have disturbances in motor control often have trouble in learning to read. The specific motor factors involved in reading are the ability to move the eyes rhythmically and accurately following a line of text, and the ability to articulate accurately. A slight muscular imbalance of the eyes may be sufficient to prevent facile and accurate eye movements in reading.

The relation of speaking to reading is obvious because articulation occurs in oral reading and probably to some extent in silent reading. There is controversy as to the amount and nature of inner speech in reading. It is probable that the thought processes of individuals differ, that some persons make use of sub-vocal speech to a larger extent than others. As a child's articulatory experiences with words naturally modify his ability to read orally, they probably also react upon his ability to read silently, whatever may be the nature of the relationship between oral and silent reading.

About eighteen percent of poor readers have articulatory speech defects, compared with seven percent of good readers. Stammering or stuttering occurs in nine percent of poor readers, compared with one percent of good readers.

Poor motor control may be a factor in attention; then in turn poor attention may affect ability to learn to read. Inattentive children are usually described as squirming, looking out the window, never holding still, flighty, etc. The ability to inhibit movements may be one requisite of good attention.

Physical conditions affecting motor control occur with some frequency among poor readers. About five percent of poor readers have suffered birth injuries; about fifteen percent of them have had diseases affecting the central or peripheral nervous system, such as encephalitis, infantile paralysis, meningitis, or convulsions. Glandular conditions, such as thyroid and pituitary disturbances, may be reflected in awkwardness of motor control. These conditions are found with some frequency among poor readers.

### C. INTELLECTUAL DIFFICULTIES IN READING

Poor readers as a group are not greatly inferior to the general population in intelligence. Poor readers referred to clinics for behavior and other clinical problems have an average Stanford-Binet intelligence quotient of 90.4, while poor readers referred only for reading disability have an average quotient of 100.9.<sup>1</sup> The intelligence quotients of poor readers depend also upon the type of intelligence tests used. Poor readers ordinarily score higher on performance type tests than on verbal tests.

Undoubtedly children of inferior intelligence who start to learn to read before they are mentally mature enough experience failure and develop undesirable attitudes toward reading. Teaching reading to children of dull intelligence requires simplified, repetitive material suitable for the children's mental ages. Backward children, of sufficient mental age, when they are given suitable materials, learn to read and to understand what they are reading, so long as the content falls within their comprehension.

### D. LINGUISTIC DIFFICULTIES IN READING

Poor vocabulary and poor facility in use of language often retard the reading process. An example will illustrate failure in reading owing to difficulty in the use of sentences.

Bertha, an eighth-grade girl of average intelligence, experienced unusual difficulty in comprehension of silent reading. Examinations revealed that oral reading and word-recognition were satisfactory for her grade, but silent-reading test scores were less than fourth grade. In one set of questions following a passage read, Bertha had failed almost every item. Her use of sentences was extremely immature, compared with the text which she was expected to read. She used sentences of five or six words, while the text was written in sentences of fifteen or twenty words. The same passage was thereupon rewritten in short sentences of five or six words, using the same vocabulary of the text, except for the connectives. Bertha was then given the same questions to answer. She immediately raised her score from almost no items right to almost all items right. Her failure in comprehension was undoubtedly related to her inability to use and understand the long, complex sentences of the text. Remedial exercises to develop better use of sentences relieved this child's disability in silent reading to a great extent.

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<sup>1</sup> Marion Monroe. *Loc. cit.*, p. 5.

#### E. EMOTIONAL DIFFICULTIES IN READING

In almost every case of reading disability, emotional reactions toward reading are observed. Sometimes the emotional disturbance is severe and persistent; at other times it is mild and easily overcome. Faulty attitudes toward reading are in many cases the result of the reading disability and disappear when the child learns to read. Recently at the Child Guidance Center, a group of fifty poor readers were rated by their teachers in a number of traits before and after remedial instruction in reading. A ten-point scale was used to measure the various traits. The remedial reading instruction resulted in noticeable changes in personality ratings. The poor readers, after learning to read, became much more alert, careful, attentive, and industrious and were improved in social traits; they showed fewer negative attitudes and became less repressed. Unusual talkativeness in school had appeared as a bid for attention in many poor readers who could not get recognition legitimately in their school work. On learning to read, the need for this attention-getting behavior was removed and the talkativeness disappeared.

The types of emotional reactions toward reading disability that have been frequently observed are (a) resistance and aggressive dislike of reading, (b) withdrawal from reading, (c) apathy and discouraged attitudes, and (d) compensatory mechanisms.

In the foregoing types of emotional manifestations, the reading disability came first and the emotion was a reaction to the disability, although the emotion might in turn become a cause and further retard the child's reading.

Emotional reactions as *primary* causes of reading disability have also been observed. Three examples may be listed:

1. Infantile mechanisms. A reading disability may strengthen the child's dependence upon the mother. There are too many instances of children who have not been allowed to mature emotionally. Learning to read may appear to be a step away from the mother's protection, which the overprotected child cannot take alone.

2. Faulty habit-training. Children who have been subjected to unwise and inconsistent training methods may find school adjustments difficult. Reading and other subjects naturally suffer until the child is helped to make a satisfactory adjustment to the routines of school life.

3. Pressure beyond ability. Children who start to learn to read

before they are chronologically or mentally mature enough for reading may become set against reading. Reading becomes something 'hard,' and school, a place where one is 'dumb' and can't do what the others do. Sibling rivalry, particularly if a younger brother or sister makes better progress in reading and catches up with an older child, may also contribute strong emotional content.

These emotional manifestations usually disappear simultaneously with the child's learning to read. If, however, the reaction does not disappear, teachers and parents may need help in their methods of handling the child and in solving their own personal problems, which sometimes are reflected in their attitudes toward the child.

#### F. METHODOLOGICAL FACTORS IN READING DIFFICULTIES

Overstress of some particular reading skill may be a cause of reading difficulties. It is desirable to have a reasonable balance between the various reading skills. Occasionally a teacher may stress one skill, such as speed of reading, feeling that it is all-important, and neglect other skills. The results of overspeeding are sometimes seen in children who read breathlessly at a pell-mell pace, guessing wildly at words, and making up the story. These children usually cannot give a coherent account of what they have read and show considerable tension.

Overstress upon oral reading may also detract from other important skills. One boy read the Stanford-Binet passage aloud with considerable flourish, and in the manner of old-time elocution. When asked to recall the content of the paragraph, however, he could remember only one or two items. He then looked reproachfully at the examiner, and said, "I didn't know you wanted me to remember it. I wasn't paying any attention to what it said."

Overstress upon silent reading may prevent a teacher from knowing just what difficulties children are encountering in word recognition. Some children can guess what the story is about from a few recognized words and from looking at the pictures. They may answer questions about the story fairly well, so that their poor reading escapes detection until standardized tests reveal the weakness or until they pass into the middle and upper grades where the books are too difficult for this process of guessing. Overstress of silent reading, therefore, often permits the child to practice faulty habits of word recognition without detection.

Failure to establish accurate word recognition by too great 'vocab-

ulary burden '<sup>1</sup> during the early stages of learning to read may prevent the development of fluent reading. Children need ample repetition of each new word, in order to fix the word for accurate, quick recall. If the materials proceed too rapidly, presenting many new words while other words are only half-learned, children may find reading a difficult and confusing process.

In many cases of reading disability slight perceptual or motor difficulties have been aggravated by poor methods of instruction.

## VI. OUTLINE FOR DIAGNOSING A CASE OF READING DISABILITY

In making a diagnosis of a case of reading disability, the examiner should study the problem from several points of view. Reading disabilities are rarely simple in causation. Usually a number of factors contribute to the problem and each of these factors should be discovered, if possible, and given appropriate treatment. A brief outline follows which suggests diagnostic procedures:

### 1. History of the Child

*a. Developmental History.* Inquire particularly concerning birth injuries that may have affected motor control or the brain areas involved in speech or reading. Inquire the age of learning to walk and talk. Reading disability cases frequently have histories of delayed speech or motor functions. Learn all you can as to the history of any specific speech defects in the child or in members of the family, since speech defects and reading disabilities are frequently related. Obtain the history of the child's handedness, noting whether he has ever shifted hand preference, either spontaneously or by training, or owing to an accident such as a broken arm. Inquire also as to familial tendencies toward right or left handedness. Obtain the history of the development of other functions, which may indicate whether the child has had a generally normal or a generally delayed growth. A history of enuresis may be significant, since this problem is met more frequently among reading disability cases than among normal readers.

*b. Medical History.* The important factors for reading disability in the medical history are the incidence of neurological illnesses, such as meningitis, infantile paralysis, convulsions, encephalitis, and chorea. Inquire concerning any diseases that may be a source of general fatigue or apathy or may have disrupted school attendance. Inquire also con-

<sup>1</sup> Arthur I. Gates. *Interest and Ability in Reading* (Macmillan Co., New York, 1930).

cerning the child's vision and hearing; has he had eye or ear trouble that may have affected these functions?

*c. Social History.* A full social history is helpful in understanding the child's personality and its effects upon his reading problem. Besides the general social history, one should observe the attitudes of various members of the child's social group toward the reading disability. How does the mother explain the disability? Does she blame the teacher, the child, or the school methods? How does the teacher explain the disability? Does she blame the parents, the child, or a former teacher? How does the child explain his disability? Does he think he is too dumb to learn or that the teacher isn't fair? Is he unaffected, blasé, timid, embarrassed, or discouraged? How do his siblings and schoolmates react toward the disability? Do they make fun of the child? Are there family rivalries in which a younger brother or sister has caught up or passed the child in school? Obtain a full school report, giving attendance, grades passed and failed, good and poor subjects, and teachers' opinions of the child's personality.

## 2. Physical Examination

If possible, a physical examination should be made as a matter of routine in each case of reading disability. The physician should examine particularly for visual, auditory, and motor difficulties, and should make whatever recommendations are necessary to put the child in as good physical condition as possible.

## 3. Psychological Examination

*a. Intelligence Tests.* In case of reading disability the Stanford-Binet test, and, if possible, a performance test such as the Arthur Performance Scale, should be given. Avoid group intelligence tests that require reading of questions and directions.

*b. Achievement Tests.* Reading tests should be given for various types of reading skills. Choose several of the following tests, according to the child's age and grade:

1. An oral reading test, such as Gray's Oral Paragraphs

2. Silent reading tests for various types of comprehension, such as Gates' Primary or Advanced tests, Monroe's Silent Reading Test for rate and comprehension, Stanford Achievement Test in Word and Paragraph Reading, Thorndike-McCall Reading Scale, Iowa Silent Reading Tests, Chapman Cook Speed-of-Reading test, Metropolitan Achievement Tests, and others.

3. A test for word recognition and word discrimination, such as Iota Word test and Word Discrimination test, Gates' Word-Pronunciation Test, and the like.

4. A spelling test such as Ayers' Scale, Iowa Spelling Scale, Morrison-McCall Spelling Scale, and others. A child who is a poor reader is frequently a poor speller. His errors in the spelling test may indicate some of his difficulties in word memory.

A test of arithmetic computation should be given to determine the child's ability to learn a subject in which reading is not a great factor. Children who have specific reading disabilities usually score somewhat higher in arithmetical computation than in reading. They may fail in arithmetical reasoning tests however, since these tests usually require the reading of problems.

c. *Analysis of Reading Errors.* From these tests the examiner should tabulate the errors made by the child and locate the most frequent types of mistakes. The reading errors may direct remedial work to specific points of difficulty. An analysis of reading errors does not always indicate the cause of the difficulty, since two children may make the same reading errors for entirely different reasons. In each case, however, the errors must be eliminated before accurate and fluent reading can be achieved. Careful tabulation of errors will guide the examiner in investigation of possible reasons for the confusions and will assist the remedial teacher in making her work as specific as possible.

The errors in oral reading and word recognition may be classified into the following types:

1. Faulty vowels, such as *card* read *cared*, *big* read *bag*, etc.
2. Faulty consonants, such as *send* read *sent*, *sort* read *short*, etc.
3. Reversals, such as *b-d-p-q* errors, *big* read *dig*, *bone* read *done*; reversed sequence of letters, *was* read *saw*, *left* read *felt*; or reversed sequence of words such as *The part of farming* read *Part of the farming*, etc.
4. Additions of sounds, such as *tack* read *track*, *pod* read *pond*, etc.
5. Omissions of sounds, such as *blind* read *bind*, *going* read *go*, etc.
6. Substitutions of words, such as *duck* read *hen*, *puss* read *kitty*, etc.
7. Repetitions of words and phrases, such as *Once there lived a king and a queen* read *Once once there lived a king and a a queen*.
8. Addition of words, such as *a boy* read *a little boy*
9. Omissions of words, such as *a little pig* read *a pig*.
10. Refusals and 'words-aided,' when the child says, "I don't know that word," "We haven't had that word," or "Please tell me what that word is."

d. *Tests of Various Factors Related to Reading.* A number of tests may be chosen to indicate special weakness or peculiarities. The following types of tests are helpful:

1. Tests of visual discrimination and visual memory.
2. Tests of auditory discrimination and auditory memory.
3. Tests of motor-control, such as a tapping test.
4. Tests of handedness, such as throwing, batting, tapping, reaching, sweeping, threading needle, etc.

5. Tests of eye preference, such as sighting through a cone, aiming a toy gun, etc.
6. Tests of vocabulary, sentence length, and use of language.
7. Tests of articulation to discover speech defects and particular speech difficulties.

After the findings in the social history, the physical examination, and the psychological tests are accumulated, the examiner should list the factors in each that may be affecting the child's reading. A program of treatment may then be worked out.

## VII. REMEDIAL METHODS IN READING

### 1. General Conditions of Remedial Work

The following suggestions are made from experience with many cases of reading disability, and may serve as a practical guide toward effective remedial teaching.

*a. Remedial work is most effective when given individually.* Under individual instruction the child is relieved of social distractions and competition, and the teacher is free to study the child's difficulties undisturbed by problems in group management.

*b. Remedial work may be given to several children at once if the children have similar types of difficulty and are similarly retarded in reading.* Noticeable progress in reading may be obtained in carefully selected groups. Group instruction may be profitable also in instances where an entire class falls below standard in a certain type of reading.

*c. Remedial work should be given at a favorable time, when the child is not fatigued.* Avoid placing the remedial work at a time when the child feels that he is 'staying in' or missing some delightful experience that his mates are having. No suggestion of punishment for poor reading should be associated with the remedial work period. If a special remedial teacher is provided for a building, she may arrange to have the children sent to her for their work at the time when the rest of the class is having its regular reading period. In this way the poor readers are saved from unfavorable comparison with the good readers and the good readers may go ahead at their own rate without having to wait for the slow ones.

*d. Remedial work should be given systematically at regular periods.* One cannot expect much progress in a few scattered attempts at remedial work. Two or three periods a week is an effective distribution for individual instruction; group instruction should probably be given daily.

*e. The remedial period should be long enough for the child and*

*teacher to become warmed up to the work, but short enough to avoid fatigue.* A half-hour is ample time for the younger children; forty minutes or an hour may be given for the older ones.

*f. The books and materials should be adapted to the level of the child's reading achievement.* A fifth-grade boy who reads with second-grade achievement, for example, should be given books of second-grade level. It is sometimes wise to avoid texts labeled 'First Grade' or 'Second Grade,' and to select attractive story books that deal as much as possible with items of interest to an older child. Admittedly, it is not always easy to find a book that combines easy reading vocabulary with more mature subject matter.

*g. Progress should be made known to the child with generous praise.* Such statements as, "I like the way you read that line," or "That last sentence was almost entirely right, but let's look at this word again," are helpful ways of encouraging the child or of pointing out an error without the stigma of failure. Every opportunity should be taken to build up the child's confidence in his ability to learn to read.

*h. Remedial reading instruction should be directed toward overcoming the child's specific difficulties in reading.* Remedial reading is not simply tutoring in general school subjects. Remedial reading instruction aims toward the removal of the handicap in reading, after which the child will be able to read and prepare his own assignments.

*i. Remedial work should be accompanied by physical and mental therapy when such treatment is needed.* As the remedial teacher works with the child specifically on his difficulties in reading, the physician, psychiatrist, psychologist, and visiting teacher should coöperate by assisting in others of the child's problems. If glasses have been prescribed or treatment indicated for physical or emotional difficulties, these suggestions should be carried out. Conferences with the parents should be arranged to explain the nature of the child's difficulty and to describe the work done in the remedial period, so that all persons concerned may understand as fully as possible the aims and methods of treatment.

*j. Retests should be scheduled at frequent intervals.* After each two or three months of remedial work, retests should be given to measure progress and to note changes that have taken place. The remedial methods may then be modified in the light of the new test results.

## 2. Remedial Methods for Specific Difficulties

*a. Suggested methods for difficulties in the mechanics of reading.* Children having severe disabilities in the mechanics of reading are

usually so handicapped that it is of little value to attempt to use reading in recreatory or work-type activities until the ability to recognize words accurately has been developed. It is often necessary to begin with preprimer materials and build up a vocabulary of simple words, reinforcing sight recognition with phonetic and kinesthetic cues. In some cases it is wise to begin with easy phonetic words, making up sentences and writing stories of these words. In less severe cases it is necessary only to straighten out certain confusions that are indicated by the child's errors.

Although the stress on mechanics of reading might be expected to be uninteresting to the child, such has not been the experience of hundreds of poor readers who have in this way improved their reading. As soon as the poor reader finds that he can learn to recognize words and phrases and read with some degree of ease, his success is even more satisfying because of his previous failure. He brings to his reading period a new enthusiasm and zeal, and a rebirth of self-respect. As soon as he can read simple material, the remedial period naturally shifts in emphasis to the uses of reading in recreatory and work-type materials. In actual practice there is no great break between teaching the mechanics and the uses of reading, as the two are intimately related. When the child is able to read a paragraph accurately, he often comments on the story, and the teacher may assist him in developing understanding and enjoyment. When he is still bungling words and phrases so that meaning is disrupted, it is just as natural to suggest ways of attacking the words and to arrange lists and sentences that give practice in detecting certain word features.

The methods described under the seven rubrics that follow have been helpful in overcoming various kinds of errors and may be used by teachers without special laboratories or materials.

1. Vowel and Consonant Errors. Training should be given first in discrimination of the consonant and vowel sounds in speech. Show the child the placement of lips and tongue in making the sounds.

For example, if the sound *p* is being studied, first show the child how the sound is articulated by compressing the lips and puffing the air through them. Then have the child indicate from pictures those objects whose names begin with *p*, such as *pipe*, *pig*, *peas*, etc. Next, discriminate the sound by selecting objects beginning with *p* from other objects beginning with closely related sounds such as *b*, as in the words, *pig*, *big*, *pat*, *bat*, etc. After the child can make these discriminations, associate the sound with the letter *p* by tracing the letter

while articulating the sound. Read a story aloud to the child, letting him watch and point to the words containing *p*. Indicate how the sound sometimes comes at the first of the word as in *pig*, sometimes in the middle as in *apple* and sometimes at the end, as in *jump*. Write lists of words containing the sound. In similar fashion review the other consonants. Confusions frequently occur in the pairs *b-p*, *d-t*, *m-n*, *g-k*, *wh-w*, *sh-ch*, *s-sh*, *d-th*, and other combinations. If the work is to be made truly remedial the teacher should find each individual's particular confusions and arrange specific exercises for each confusion.

The same type of training may be given in teaching the vowel sounds. First, show the child the vowel position in articulation; next give lists of words that illustrate each particular vowel; then discriminate the vowel from other similar vowel sounds.

An illustration will show how a reading error may serve in arranging lists of words for specific drill. Let us suppose that a child reads *form* as *farm*. Three steps are required for overcoming this confusion. First, establish the sound of *ar* by such lists as *arm*, *barn*, *bark*, etc. Second, establish the sound of *or*, by such lists as *for*, *fork*, *corn*, etc. Third, discriminate *ar* from *or* in such lists as *barn*, *born*, *farm*, *form*, etc. The discrimination drills may be made in meaningful context, by completion exercises such as, "We went to the \_\_\_\_\_. (farm, form)" The child chooses the correct word and writes it in the blank. By means of these steps, the teacher may eliminate not only the original reading error but also similar mistakes that the child would have made elsewhere.

2. Additions and Omissions of Sounds. Frequent errors are the insertion or omission of *r*, *n*, or *l* in such instances as *black* for *back*, *pond* for *pod*, etc. Such insertions and omissions may be eliminated by reviews of the consonant blends. Lists such as *pan*, *plan*; *back*, *black*; etc.; *bed*, *bend*; *pod*, *pond*; etc.; or *tap*, *trap*; *fog*, *frog*; etc., are helpful in calling attention to single consonants and their blends with other consonants. Meaningful materials as well as word lists may be used by having the child select the proper word for the blank in sentences such as the following: "The train is on the \_\_\_\_\_ (tack, track)."

Additions and omissions of syllables frequently occur also. Some children omit beginnings, reading *session* for *possession*; others omit endings, reading *possess* for *possession*; still others omit the center of the word, reading *possession* for *possession*. Lists of words arranged by similar syllables are helpful in calling attention to particular parts of words.

Thus, a list such as *intend, invite, instead*, etc., calls attention to the similar beginning. A list such as *attention, convention, addition*, etc., stresses the final syllable. A list such as *tend, pretend, pretending, superintendent, extending*, etc., stresses a frequent syllable that occurs sometimes in the middle, sometimes at the end of words. Even young children often become very much interested in learning that a prefix, suffix, or root has a meaning that may be traced in many words. The building of words by syllables assists the child, not only in overcoming his additions or omissions of syllables, but also in understanding the meanings of words.

3. Reversals. These may be overcome by methods that stress the direction of reading. Sliding a finger or pencil along the text while reading is helpful in giving the child a kinesthetic cue to the direction of reading. Tracing, with finger or pencil, a word written in large letters, while saying the word slowly, is helpful in coördinating the proper sequence of letters with the sequence of sounds. Underlining the text while reading is also helpful in stimulating the proper direction of reading. By this procedure, the child may not only see clearly the direction of movement, but also easily make the return sweep to the beginning of the next line.

4. Repetitions. These may result from inadequate word recognition. The child comes to a word he does not recognize and repeats the preceding words in an effort to discover the unknown word. In such cases help may be given in methods of attacking new words, and the repetitions may be eliminated simultaneously. In other instances, repetitions may be associated with reversals as a type of regressive movement. The methods described under reversals, particularly underlining while reading, are also helpful in overcoming repetitions. Overstress of speed may cause a child to repeat. By saying a sentence over several times very fast, the child may feel that he is reading quickly and so may persist in this habit to disguise the fact that he really reads very slowly. Encouraging a slower rate of reading may be helpful in overcoming this type of repetition. Reading aloud with the child may also assist him in overcoming habitual repetition. In such concert reading, the teacher should begin reading very slowly, and gradually increase her speed from week to week as the child learns to keep up with a faster rate. The concert reading serves to prevent repetitions and also to develop better phrasing, since the child tends to pause when the teacher pauses, and to follow her grouping of words.

5. Substitutions. Substitution of words from context is not a seri-

ous type of mistake, so long as the substitution is logical and the meaning of the text is not disturbed. If the child is guessing at large numbers of words from a meager context and is making up the story largely from pictures and imagination, special help should be given in other ways of recognizing words. Phonics, and word games in which words are recognized isolated from their contextual cues, are helpful in developing more accurate recognition and overcoming substitutions. Sentences in which the substitution would be absurd are helpful in pointing out differences between words. For instance, a child who persisted in reading *mouse* as *rat* quickly learned the difference between the words when he tried to complete the sentence, "The cat caught a r\_\_\_\_\_, but the little kitten caught a m\_\_\_\_\_."

6. Additions and Omissions of Words. These additions and omissions are not serious errors unless the meaning of the text is disrupted. Superior, fluent readers often add adjectives and conjunctions or leave out words not highly important for meaning. If the additions and omissions change the meaning of the text, however, special help should be given. Sentences with and without the inserted words may be compared for meaning. Concert reading with the teacher is also helpful, since the additions or omissions disrupt the harmony of the reading and therefore cause an unpleasant discord. Omissions of complete lines are serious errors and need special help for correction. Using books with wide line spacing at first and gradually decreasing the space between lines is helpful. Underlining with a pencil while reading makes an omitted line conspicuous and helps the child to avoid line-skipping.

7. Silent Reading Exercises. The remedial work just described for overcoming errors in the mechanics of reading requires considerable oral reading. Oral reading permits the remedial teacher to know at all times the errors that the child is making and the difficulties he is encountering. But it is desirable to include silent reading in the remedial work as soon as the child is able to read with sufficient accuracy that he will not practice many uncorrected errors in his silent reading. Silent-reading materials should be slightly easier than those the child is able to read orally, in order to insure as great fluency as possible. Silent reading should be checked by questions as to content to determine whether the material has been understood. When the child can read accurately and with comprehension silently, attempts may be made to develop speed. A chart may be kept of the number of words read per minute or the time for reading pages of reasonably uniform difficulty. Children take pride in observing their progress on such a chart. In all speed work it is wise

to bear in mind that some children may become emotionally upset or may increase their errors if they are pressed to respond more quickly than they comfortably can. In that case the emphasis should be changed. Speed usually develops with practice and as errors are eliminated, without specific pressure. At the conclusion of each timed passage, the teacher should question the child over the content. Unless he gives evidence that he has comprehended the content, the speed score should not be recorded on the chart, but the child should reread the passage aloud in order that the teacher may locate his difficulties and assist him in getting the meaning.

*b. Suggested methods for the use of reading in recreatory and work type activities.* After the child has learned to read accurately and fluently enough to comprehend the books of his grade, the teacher should continue the remedial work to its most important conclusion, the utilization of reading in study and recreation. The retarded reader has missed the extensive use of reading that his classmates have had. He needs to broaden his reading experience and frequently requires assistance in reading as a means of study. The following methods are helpful in removing the residual handicaps of a poor reader who has partially overcome his disability and also in assisting normal readers who fall below their classmates in certain types of reading.

1. Methods of Locating Materials. Sometimes a child is unable to prepare an assignment because he cannot locate the materials to read. He spends his effort thumbing unsystematically through books and has little time left for reading after he has found the references dealing with the assigned topics. Specific exercises in using tables of contents, the index, and card catalogs are helpful. Often it is necessary first to instruct a child in alphabetical arrangement. Many children do not know the sequence of the alphabet well enough for practical use. Games may be devised in which the teacher names one letter and the child replies with the following or preceding letter. The telephone directory provides good practice in alphabetical arrangements. The child may enjoy looking up his friends' numbers and making a directory for his personal use. Sorting and filing material alphabetically is also helpful practice. Sometimes failure to use an index results from inability to spell the words or names that are used in the topic the child is trying to locate. Spelling exercises necessarily accompany the remedial work in such cases.

The child should be able to skim in order to find material quickly. Practice in skimming may be given first, by locating a certain word

in glancing through a sentence or a column of words; then by locating a specific sentence or phrase on a given page; and finally by locating a sentence on a given page that answers a specific question or deals with a particular topic. It may be helpful first to print the word or sentence to be found on a separate card in order to give the child a definite visual impression of the material wanted. Later he may learn to supply the visual image himself or in other ways keep clearly in mind the object of his search.

2. Methods of Reading for a Given Purpose. Sometimes it is necessary to read for general ideas; at other times for specific details. The child should learn to distinguish which type of reading is required in any study assignment. Workbooks are available that provide practice in completion exercises, underlining correct answers, and other types of reading. These workbooks contain materials in remedial work for developing comprehension. In some cases comprehension of reading is poor because a child's general language facility is poor. Many poor readers are deficient in other language skills, such as vocabulary, sentence structure, grammar, as well as in reading. They use such phrases as 'in the distant' instead of 'in the distance,' and have difficulty in differentiating parts of speech. If the remedial teacher will take down verbatim the sentences used spontaneously by poor readers, the results may throw considerable light on their difficulties in comprehending language. In some cases, exercises in pointing out differences between the adjective or noun meanings of such words as *distant*, *distance*, *violent*, *violence*, *patient*, *patience*, etc., are helpful in developing a more precise understanding of the text. Especially in meeting the difficulties exhibited in upper-grade and high-school reading are such exercises valuable.

3. Methods of Reading for Recall. Not only must the child be able to read and understand his assignments, but he also must be able to organize the content for recall if he is to use reading successfully in study. Some children conscientiously read their assignments, understand them while reading, but are unable to respond effectively in recitations or examinations because they have no adequate method of recalling what they have read. It is difficult to keep in mind large quantities of material and the effort to do so may be emotionally unpleasant. It is easy, however, to remember a few key sentences or phrases, each of which may logically lead to the recall of other ideas. Hence, practice should be given in selecting topic sentences, in outlining, and in summarizing. Some authors present their materials in organized form,

easy to outline; others adopt a rambling, informal style, more difficult to follow topically. By choosing material at first that is easily outlined, the child may discover how to select the central topics and how to relate subordinate ideas to each central thought. Preparation of compositions from outlines is also helpful in this type of work.

4. Methods of Reading for Appreciation. Appreciation involves emotional satisfaction as well as intellectual recognition of merit. Probably the emotional satisfaction comes first, and the intellectual recognition is a later and more adult analysis. A teacher may communicate her emotions to her pupils by facial expression, vocal intonation, and the like. If she has sincere appreciation for literary quality, she may read an excellent passage to her pupils and find them responding also with enjoyment as she brings out by inflection and phrasing the beautiful or dramatic portions of the passage. The development of appreciation depends largely upon the ability of the teacher herself to appreciate and upon the existence of a rapport, or sympathetic understanding, between teacher and pupils that permits spontaneous and natural expression of emotion. Intellectual recognition of quality may come later as good and poor passages are compared in style and richness of ideas.

Occasionally children develop liking for cheap, sensational literature. Consequently, remedial work in the correction of poor taste may involve an inquiry into other factors in the child's personality. He may find an outlet in such reading for unsatisfied life desires. Sometimes recreational guidance in other channels than reading may be needed to give the child satisfying and real experiences to replace the imaginary ones. In other cases an analysis may reveal simply a liking for fast-moving narratives. The teacher or librarian may easily substitute good books of high activity content for the inferior books and find that the child enjoys them even more keenly because the action is more effectively portrayed.

### VIII. CONCLUSION

Remedial methods should at all times be flexible and adapted to the peculiar needs of the individual. If the nature of the child's difficulty is thoroughly understood, the teacher may often work out a suitable method as a logical result of her study of the child. In all remedial work the teacher should start first with the child and then find the appropriate method. Fit the method to the child, not the child to the method.

After the proper diagnosis of the child's difficulty, remedial work, if carried out consistently, is usually highly successful. The foundation of remedial success is careful observation of the pupil, with thorough diagnostic analysis, careful tabulation and study of his errors, and ingenuity in applying specific treatment.

Remedial work should not be stopped too soon, but should be continued until the child's reading achievement is adequate for his other capacities. When this state has been reached, marked improvements in school achievements and behavior almost invariably follow. It is this ultimate influence on the child's effectiveness and on his developing personality that gives to remedial reading its great importance.

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## CHAPTER XIII

### DIAGNOSIS OF DIFFICULTIES IN ENGLISH

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#### I. THE SCOPE OF THE TEACHING OF ENGLISH

The problem of evaluating outcomes in the teaching of English increases in complexity with the demands made upon the subject. English today is concerned, first of all, with the development of ideas, the stimulation of thought, the exercise of powers of observation, appreciation, and interpretation of all the elements in one's environment about which one may wish to communicate with others or to commune with oneself. It aims, therefore, so to organize the life of the classroom that such communication may have a reasonable basis in the meaningful activities of the school day and that pupils interested in voluntary creative expression may be stimulated and encouraged to that end. The teaching of English concerns itself also with the power to manipulate ideas, to recognize relationships, and to draw conclusions. It promotes ability to select and organize materials for effective presentation to others. It fosters the power to express those ideas with force and originality in words adequate for the purpose and in form which, by reason of its clarity and correctness, facilitates rather than hinders their transmission. In so far as the processes of oral and written English are differentiated one from the other, it involves the development of both these skills to a degree commensurate with the demands of everyday life. It requires of the teacher ability to develop in boys and girls adequate techniques for the varied expressional modes of ordinary speech and writing; that is, informal conversation, letter writing, giving reports, relating anecdotes, making announcements, and the like. Finally, the teaching of English involves not only emphasis upon these elements as unitary parts of a larger program, but also the transfer of the skills acquired in them to all the expressional activities of life both within and without school.

## II. THE NEED OF SEEING THE PROBLEM WHOLE

The intangibility of many of the most fundamental aspects of the problem has led the teacher to center attention primarily upon those elements capable of segregation for drill, improvement in which is measurable by paper and pencil techniques. Because of the danger of false emphasis, it is imperative that the teacher should see the problem whole; that he should lay out for himself periodically the varied objectives of his teaching in order to check his own practice for adequate consideration of its many functions. This duty of the teacher is especially important at a time when extremists in curriculum-making veer now to imaginative writing and verse forms, now to practical communication alone, and now to a program basing all of the expressional activities of the school day upon topics in American History or the institutions basic to community living. It is the business of the teacher to look at the child and to look at life, then to proceed according to the interests and the necessities of both.

## III. THE OBJECTIVES OF THE TEACHING OF ENGLISH

The objectives of the teaching of English have been variously stated by investigators whose work is summarized by Lyman.<sup>1</sup> The following statement incorporates the results of these investigations, attempting at the same time to relate the objectives one to the other. It includes both the general goals toward which English instruction aims in common with other subjects and those peculiar to its own field.

### *Objectives of the Teaching of English, with Their Attendant Contributory Abilities*

- I. To broaden pupil interests and appreciations through observation and evaluation of experience
  - A. To arouse in pupils an interest in, and an understanding of, specific experiences which they meet daily
    1. Intimate personal experiences with nature, animals, family, and friends
    2. Larger social experiences of school and community
  - B. To assist pupils to recognize the significance of these experiences for the enrichment of personal and social living

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<sup>1</sup> R. L. Lyman, "Summary of investigations relating to grammar, language, and composition." *Supplementary Educational Monographs*, No. 36, pp. 5-12. (University of Chicago, Jan., 1929.)

II To develop in pupils the habit of clear, orderly thinking about matters within their own experience

- A. Ability to sense chronological sequence of happenings
- B. Ability to see the relationship of cause and effect in personal experience and in material read
- C. Ability to arrive at trustworthy independent judgments on the basis of fact and experience

III. To promote in pupils the power to organize and express their ideas effectively for others

A To assist pupils to gather from experience and from reading, elements bearing upon their immediate purposes in speech or writing

- 1 Ability to stick to the subject
2. Ability to select material of interest to reader or listener
- 3 Ability to discriminate between important and unimportant material for the purpose in hand

B To help pupils to organize such materials effectively for presentation to others

1. Ability to marshal evidence or facts concerning the problem under consideration

- a. From observation and experience
- b. From letters or interviews
- c. From books, pamphlets, and magazines

2. Ability to sense relationships between ideas
3. Ability to outline ideas in logical sequence, showing proper relationship of major and minor aspects through use of recognized outline form

4. Ability to begin and end effectively
5. Ability to present a report of reading or experience keeping the foregoing principles in mind

C. To give pupils an increasingly adequate vocabulary

1. Ability to use effectively the general speaking and writing vocabulary of ordinary social and business communication

2. The desire and power to add to this general vocabulary, words commensurate with individual purposes and ability

3. An interest in words and power of discrimination in the choice of words for specific purposes

D. To give pupils adequate mastery of the mechanics of written expression

1. An adequate sentence sense
2. Ability to write well-unified and coherent sentences
3. Adequate skill in the development of ideas in well-rounded paragraphs

4. Mastery of the commonly accepted forms of correct grammatical usage

5. Mastery of the commonly accepted requirements of capitalization, punctuation, and manuscript form

6. Ability in, and sense of responsibility for, the use of legible handwriting

7. Ability in, and a sense of responsibility for, the correct spelling of words in common use

E To give pupils adequate mastery of the principles of effective speech

1. Sense of purpose and plan in speaking

2. Effective presentation of ideas

3 Audience contact

4. Agreeable, effective use of voice

5. Careful pronunciation, enunciation, and articulation

IV. To promote among pupils ability in the clear, simple, effective uses of English necessary to the everyday intercourse of the social and business world

A. Ability to set forth one's own point of view in informal discussion clearly, effectively, and with proper courtesy

B. Ability to answer directly and exactly a question on which one has the necessary information

C. Ability to communicate necessary facts clearly, forcefully, and with proper conciseness and completeness in telephone conversations, announcements, letters, interviews, reports, instructions or explanations, minutes, etc.

D. Ability to relate an incident or a personal experience in conversation or in writing, making it clear and interesting to listener or reader

E. Ability to carry on conversation with due regard for the interests and rights of others

F. Ability to gather and organize facts or ideas for longer, more formal presentation in speech and writing

G. Ability to conduct or participate in a public meeting or formal discussion with proper attention to parliamentary form

V. To promote the use of correct and effective speech and writing in all subjects and in all activities both within and without school

A. To make pupils conscious of the importance of correct form and usage in the accomplishment of social and business purposes

B. To stimulate in pupils the desire to speak and to write effectively and according to socially acceptable standards of form and usage

- C To develop attitudes of intelligent self-criticism in matters of effective expression and correct form
- D. To assist pupils habitually to apply these principles in all speech and writing whether in school or out
- VI. To give opportunity for creative expression in the various fields of literary effort
  - A To arouse pupils to a sense of the value of originality and creative expression in the everyday intercourse of the social and business world (Activities under IV)
  - B To give pupils opportunity to try their powers in voluntary creative activities, such as story-telling, dramatization, informal prose, and the writing of verse

#### IV. ELEMENTS CONTRIBUTING TO SUCCESS OR FAILURE IN ENGLISH

In diagnosing pupil difficulties in the various phases of English represented in such a statement of objectives, the teacher will find it necessary to keep in mind the many elements basic to free and effective expression.

##### 1. Health

In the first place, health of mind and body are fundamental to success in English as in any other field of endeavor. The Madison Public Schools, in approaching the problem of improvement in instruction in language, appointed a committee on *Language Expression and Health*, the report of which is significant for teachers everywhere.<sup>1</sup> The list of physical factors found to be responsible for such language difficulties as inability to listen, lack of vigor in voice quality, lack of poise, failure to volunteer, indifference, docility, or lack of interest in revising or improving expression includes such handicaps as malnutrition; fatigue; improper physical habits; defects of vision, dentition, or hearing; heart affections; and the presence of diseased tonsils or adenoids.

Types of language difficulties, on the basis of which individuals were segregated for case studies, occurred in the following order:<sup>2</sup>

<i>Rank Order</i>	<i>Language Difficulty</i>	<i>Frequency of Appearance</i>
1.	Embarrassment in speaking before class; timid	243
2.	Eager to talk, but few ideas; aggressive	119
3.	Speech too low or fast	112

<sup>1</sup> Madison Public Schools, *Language Curriculum, Committee Reports*, Part I, pp. 43-58. (Madison, Wisconsin, 1932.)

<sup>2</sup> *Ibid.*, p. 45.

<i>Rank Order</i>	<i>Language Difficulty</i>	<i>Frequency of Appearance</i>
4.	Inability to listen	104
5	Rambling talk	72
6 5.	Grammatical errors	67
6.5.	Unwillingness to take part in discussion	67
8.	Indifference to discussion	60
9.	Lack of originality	56
10.	Too much docility	20

A case study quoted from among the many presented in the report illustrates the process of diagnosis and treatment, together with its effect upon school achievement:<sup>1</sup>

#### *Alice*

Alice entered First A in September. She was a very listless, pale child, with little facial expression. She did not respond to any discussion. When called upon individually, she had little to contribute and would stand, first on one foot, then on the other, twitching her shoulders. Criticism made little difference to her. Her interest span was short. Alice did not speak distinctly. She mumbled her words and did not seem to use her mouth muscles. It apparently was too great an effort.

The physical examination in September showed thyroid, a slight speech defect, and 14 percent underweight.

Following the doctor's recommendation, the tonsils were removed at once, and the child was placed in the nutrition room.

Alice began to gain in weight immediately. Shortly afterward there was a marked improvement in attitude and school work. The first definite interest shown was in stories. She soon volunteered to tell them and gradually became a fairly good story-teller. Interest spread to the other activities of the room, until she was efficient enough to be placed with the X group in reading.

From a dull, listless girl, she became a happy, co-operative child, eager to participate in every phase of work or play that was executed in the room.

She continued to gain in weight until she was up to average. Her eyes sparkled; her color improved; her general expression gave evidence of a feeling of well-being.

She was very regular in attendance. With the exception of a short time when she had her tonsils out, she missed no school during the semester.

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<sup>1</sup> *Ibid.*, pp. 50-51.

Her standings improved as follows:

Language	Health	Reading	Spelling	Writing	Music	Drawing
D	D	C	C	C	C	C
B	B	B	B	B	C	C
B	B	B	B	A	B	B

## 2. Mental Capacity

Not only the physical bases of mental health, but the actual mental capacity of the child as well should be known to the teacher who is diagnosing pupil progress in English. National norms, for instance, based upon state averages throughout the nation, are too low to be used as an index of achievement for the superior pupil or even for the average pupil in states of recognized educational standing, and may well be too high for pupils of lower than average ability. Just as the teacher of a Z group resents the measurement of his teaching ability in terms of the objective standards attained by his grade, so the individual pupil of low I.Q. demands evaluation in terms of the achievement of others of his own level of ability.

Too little is known concerning the methods of instruction suited to pupils of varied degrees of intelligence. It is the peculiar province of the teacher to experiment constantly with the problem, so that objective evidence of this kind may soon be available. That generalizations of any ordinary complexity — for example, the spelling rule or the abstract grammatical principle — are unsuited to the child of low mentality is an established fact. Specific attack upon habit formation, with consideration of grammatical backgrounds postponed even until the tenth year, is suggested, for instance, by the Denver modified content program for pupils below the average in ability.

## 3. Social and Environmental Factors

English is essentially a 'social' study. In its fundamental aspects it is based upon social interactions and social adjustments. It is significant that those elements of English in which adults participating in the Clapp Report judged their schoolroom training least adequate are precisely those related to the social aspects of the subject.<sup>1</sup> For this reason, the social and environmental backgrounds of the individual are of tremendous significance in the analysis of pupil difficulties in language. The child may live under conditions of strain, lack of

<sup>1</sup> J. M. Clapp, *The Place of English in American Life*. National Council of Teachers of English, Chicago, 1926.

sympathy and understanding, or too much sympathy and overindulgence. The presence of other children in the home whose accomplishments have been either noteworthy or mediocre, the domineering of pupils on the playground, a slight physical handicap or speech defect made the butt of laughter, the dominance in the home of the idea that 'children should be seen and not heard' or conversely that they should hold the floor on every occasion — these and a host of other factors, including want and privation, condition to a large degree the ability of the individual to adjust to the social situation in the classroom.

Language power, perhaps more than any other single ability, is the outgrowth of richness of environment and of depth and breadth of experience. What the home has offered the child in this respect will be influential to a large degree in determining the handicaps or lack of them that he meets in the expressional activities of the school. Only, therefore, when the records of the personnel division and the findings of the visiting teacher supplement those of the testing bureau can the teacher hope adequately to understand pupil difficulties in English.

#### 4. Interests and Attitudes

Lack of interest in English is a large cause of failure, among boys especially. Such an attitude precludes any purposeful attack upon the difficulties involved or any real desire for improvement. Investigations at the high-school level reveal a disproportionate number of failures in English in comparison with those in other fields. Many pupils obviously build up a habit of failure in the subject, with all the unfortunate attitudes that such a situation engenders. It is fruitless, under such circumstances, for the teacher to continue meaningless drill or to enforce attendance at after-school classes in remedial English. Every effort should be made to get at the root of the trouble. Perhaps an academic attitude has been adopted by the teacher. English skills may have been taught apart from the use made of them in life, so that the procedure has no meaning for the child. It may be that the topics about which he is asked to speak and write are artificial. Or again, he may never have had opportunity to test in real life the value of effective speech or writing. Possibly the standards he is asked to meet are unreasonable or are based upon the understanding of generalizations or abstractions in grammar rather than upon ability to use language. These and numerous similar problems are of tremendous import to the teacher who would establish helpful basic attitudes for the improvement of the pupil's use of English.

### 5. Pedagogical Factors

Having reviewed the conditions of health, mental capacity, social environment, and attitudes toward the subject, under which the child's powers of expression have developed, the teacher should then seek, in the pedagogical processes of his own classroom, evidences of the factors that work toward the promotion or limitation of pupil growth in language power. Limited progress may be due to one or more of many causes. The following questions are suggestive of the type of self-analysis helpful in the determination of the causes.

1. To what extent do I recognize in my teaching the varied objectives of the teaching of English? Do I confine my teaching largely to textbook exercises in correct form or usage? Do I emphasize technique at the expense of having something to say?
2. Do I recognize English as a *social* subject, providing a sympathetic classroom atmosphere for the sharing of experience and for the give and take of friendly discussion?
3. Do I provide a rich school environment, capable of stimulating intellectual curiosity, social interaction, and growth in expression?
4. Do I motivate all English teaching through constant use of normal expressional situations in school and out?
5. Do I set a standard of correct and effective speech and writing in my own use of English?
6. Do I develop among boys and girls a respect for good English and the desire to speak and write according to accepted standards?
7. Do I foster self-criticism among boys and girls through the presentation of available standards of power and correctness?
8. Do I adapt instruction to the individual needs and capacities of my pupils, both as to types of experiences in speech and writing and as to provision for remedial drill?
9. Do I furnish a program for maintenance of skills, with provision for pupil analysis of progress made?
10. Do I stress fundamentals — not niceties of expression — for which my pupils can see real need?
11. Do I provide constantly for carry-over of skills into all expressional activities, both within school and without?

### 6. Learning Difficulties

a. *In Thought and Expression.* Little research is available with respect to expressional difficulties of pupils (apart from matters of correctness of form and expression). In general, the difficulties seem to be associated with (1) lack of motive for expression, (2) a consequent

paucity of ideas, (3) a failure to sense relationships and logical sequence in the presentation of ideas, (4) insufficient command of vocabulary, and (5) lack of clarity and force in expression.

*b. In the Mechanics of English.* Studies of pupil errors in expression have produced, in the main, lists of segregated grammatical errors that the teacher was able to record in the course of the day's recitations. In spite of the obvious limitations of these studies, teachers facing the problem of diagnosing pupil difficulties in English should familiarize themselves with the results of such investigations as summarized by Lyman.<sup>1</sup> In general, they reveal as a primary problem weaknesses in the use of verbs; that is, in such elements as failure of the verb to agree with its subject, confusion of past and present tenses, interchanging of past tense and past participle, and use of a wrong tense form of the verb. Syntactical redundancy looms large in the elementary-school studies; so also do the improper uses of the pronoun and the double negative.

What is of greatest moment is the fact that such studies reveal a few items as responsible for a large proportion of the total number of errors. Charters suggested that elimination of error in fourteen common verbs would do away with sixty percent of all oral errors made in his study. The recent investigation in Madison shows four items responsible for more than half the total number of errors from the kindergarten through the sixth grade: (1) use of the double subject, (2) use of *ain't* or *hain't*, (3) confusion of *saw* and *seen*, and (4) use of the double negative. As in all other studies, improvement of pupils from grade to grade is shown to be slight, suggesting that the present methods of attacking the problem have little effect upon the elimination of specific errors. Mistakes were made by only forty-five percent of the pupils, and the errors were so varied as to suggest group or individual rather than class treatment.<sup>2</sup>

*c. In Sentence Structure.* Such analyses of pupil difficulties in usage, by reason of the methods employed for recording errors, have tended to blind the teacher to more serious faults of sentence structure less easily detected on the run. O'Rourke, for instance, listing types of error in order of difficulty for Grades VII through XII in his recent nation-wide study of English, shows problems involving sentence structure to be first in difficulty in every grade; items involving careless omission or repetition, second; and failure to express clear meaning,

<sup>1</sup> *Op. cit.*, pp. 71-106.

<sup>2</sup> *Op. cit.*, p. 87.

third.<sup>1</sup> Errors conspicuously at the foot of the list in difficulty are case uses of pronouns and the forms of verbs—precisely the errors at the top of the list in previous tabulations of the Charters-Miller type. The results suggest either unusual strides in the elimination of these errors, owing to the influence of such investigations, or previous ignoring of the problems of sentence structure in the recording of pupil errors in English.

Pressey, analyzing pupil errors in sentence structure in 980 papers written by pupils in Grades VII to XII, gives the following evidence concerning proportion of error on various elements:<sup>2</sup>

<i>Elements of Difficulty</i>	<i>Percent of Error</i>
Stringy sentences	33
Fragments used as sentences	11
Pronoun with no antecedent	11
Pronoun not near antecedent	7
Change in tense	7
Miscellaneous	7
Lack of parallel construction	5
Redundancy and repetition	5
Omitted word or phrase	5
Generally incoherent sentence	5
Lack of parallel construction	4

Frogner,<sup>3</sup> analyzing fragments and run-on sentences in 2,821 compositions for Grades VII, IX, and XI, finds noun and adjective clauses giving significantly less difficulty as fragments than the adverbial clause; and clauses in general less frequently written as fragments than lengthy phrases of the appositive type; for instance, "I am making three scrap books: *one of my favorite actors and actresses, another of places famous in history and literature, and still another of poems I like particularly well.*"

Recent studies of the development of sentence control have been positive in emphasis, relating to the recording of evidences of increased

<sup>1</sup> L. J. O'Rourke, *Rebuilding the English-Usage Curriculum to Insure Greater Mastery of Essentials*, p. 38. (The Psychological Institute, Washington, D. C., 1934)

<sup>2</sup> S. L. Pressey, "A statistical study of children's errors in sentence-structure." *English Journal*, 14: Sept., 1925, 529-535.

<sup>3</sup> E. Frogner, "Problems of sentence structure in pupils' themes." *The English Journal* (H. S. Ed.-Col. Ed.), 22: Nov., 1933, 742-749.

maturity of expression. Length of sentences, increase in the ratio of complex and complex-compound sentences, and the corresponding decrease in simple and in loosely compound or run-on sentences are indicative of pupil progress in composition. Variety in word order is another index of maturity, as are the use of concrete versus general diction and the decline in ego-centrism revealed in a reduction of the number of sentences beginning with the pronoun *I*.

Of some fourteen elements of composition considered in numerous studies of pupil errors in English, capitalization ranks commonly about fifth in difficulty and punctuation first, though the categories used in these studies have been so varied as to make comparison of their results a well-nigh impossible task. According to Guiler,<sup>1</sup> even in Grade VIII pupils in the Ohio Survey were unable to capitalize correctly names of sections of the country, names of seasons, important words in a title, proper adjectives, or titles used with persons' names on fifty percent of the occasions in which they used them.

Pressey<sup>2</sup> found forty-two percent of the errors in capitalization due to failure to capitalize the first word of a sentence, or in a lesser degree, to wrong capitalization of fragments as if they were sentences. Though other investigators have not found this the most common of errors, its frequency is in every case greater than the seriousness of the error will permit. Of eight types of mistakes in capitalization, Symonds<sup>3</sup> found it first in difficulty in Grades IV through VI, second in Grade VII, and third in Grade VIII. He shows that "the habit of commencing a sentence with a capital letter may be formed early, but that ability to tell when one is beginning a new sentence is a skill that offers considerable difficulty. The problem, therefore, is one of sentence sense quite as much as of punctuation or capitalization.

Errors of omission occur much more frequently in capitalization than do errors of insertion, with the exception of the capitalization of common nouns. Pupils capitalize common nouns as frequently (in some studies twice as frequently) as they fail to capitalize proper nouns. Recent investigations tend to indicate that the problem is closely asso-

<sup>1</sup> W. S. Guiler, "Analysis of capitalization errors." *English Journal*, 20: Jan., 1931, 21-26. The initial study using the error quotient device used by Guiler is by M. J. Stormzand and M. V. O'Shea. *How Much English Grammar?* (Warwick and York, 1924.)

<sup>2</sup> S. A. Pressey, "A statistical study of usage and children's errors in capitalization." *The English Journal*, 13: December, 1924, 727-732.

<sup>3</sup> P. M. Symonds and B. Lee, "Studies in the learning of English expression, No. II, Capitalization." *Teachers College Record*, 30: April, 1929, 686-692.

ciated with knowing when certain nouns are common and when they are proper, as for instance, sections of the country versus directions, and general names or relationships, such as *company*, *school*, *scoutmaster*, and *uncle* versus specific titles like *The White Company*, *Jefferson Junior High School*, *Scoutmaster Jones*, and *Uncle Henry*. Seasons likewise cause difficulty. Proper capitalization of titles of books, articles, and the like, together with capitalization of the beginning of a direct quotation, completes the list of major difficulties in capitalization.

Studies of pupil error in punctuation are subject to all the difficulties met with in capitalization plus an even more serious one; namely, that current usage has reversed old-time decrees concerning so many of the items as to render the evidence of doubtful value. Previous investigators, who demanded the comma wherever a dependent clause occurs first in a sentence, found a relatively large proportion of errors on that point. Today, optional use of the comma in this situation, except where essential for clearness, makes the previous findings valueless. The same is true concerning optional use of the comma before the *and* in a series and before the short parts of a compound sentence connected by *and*. Teachers will wish to familiarize themselves with the recent report of the usage of 168 publishers prepared by the late S. A. Leonard for the National Council of Teachers of English.<sup>1</sup>

A rough estimate of difficulty has been obtained for eight representative studies, three in the elementary school, three in the high school, and two at the eighth- and ninth-grade levels. The following rating as to difficulty is based upon the number of studies in which each item appears in the top one-third, the middle one-third, or the lowest one-third in difficulty. An item consistently in the top one-third in difficulty would average 3; in the middle one-third, 2; and in the lowest one-third, 1.

#### SIXTEEN PUNCTUATION ITEMS WITH ROUGH INDEX OF DIFFICULTY IN EIGHT STUDIES<sup>2</sup>

(Starred items are subject to revision according to current usage.)

- \*3.00 Comma between independent clauses of a compound sentence
- 2.89 Apostrophe
- 2.60 Period at end of declarative sentence

<sup>1</sup> S. A. Leonard, *Correct English Usage*. (National Council of Teachers of English. Chicago, 1932)

<sup>2</sup> In addition to the studies by Guiler, Symonds and Lee, and Stormzand and O'Shea, already mentioned in the chapter, the following were used:

(1) Brueckner and Wasserman, Study of pupil errors in punctuation reported

- \*2.50 Comma with a dependent clause out of order
- 2.25 Comma with non-restrictive clause
- 2.25 Unnecessary comma inserted
- 2.16 Comma with appositive
- 2.00 Comma with parenthetical expression
- 2.00 Use of quotation marks
- \*2.00 Comma in the series
- 1.80 Period with abbreviations
- 1.80 Comma before broken quotation
- 1.66 Comma between city and state
- 1.50 Comma with direct address
- 1.20 Comma in dates
- 1.00 Interrogation

Such findings are useful in directing the attention of the teacher toward common sources of difficulty in English. More important, however, than knowing the results of general investigations is the teacher's own discovery, as early in the course as possible, of the particular elements of strength and weakness in the work of individual pupils under his direction.

#### V. THE PROBLEM OF DIAGNOSIS AND REMEDIAL WORK

The first step in the actual diagnosis of pupil difficulties in English is the careful consideration of the objectives to be achieved. Analysis of those already presented in this chapter reveals the fact that in English they fall into three major categories: (1) development of certain *powers* of expression, (2) mastery of certain *skills* in the mechanics of expression, and (3) establishment of desirable *attitudes, appreciations, and habits of work*. In each of these, therefore, the teacher's problem is to discover (1) to what extent the objective is being realized, (2) what are the elements of strength and weakness in the work of the individual pupil, (3) what are the causes of failure in each case, and (4) what remedial measures should be applied. The problems raised by the three objectives will be considered in order.

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in *Diagnostic and Remedial Teaching* by L. J. Brueckner and E. O. Melby, pp. 359-364. (Houghton, 1931)

(2) Diebel and Sears, "A study of common mistakes in pupils' written English." *Elementary School Journal*, 18: Nov., 1917, 172-185.

(3) Johnson, "Persistency of error in English composition." *School Review*, 25: October, 1917, 555-580.

(4) Lyman, "Fluency, accuracy, and general excellence in English composition." *School Review*, 25: Feb., 1918, 85-100.

(5) Willing, *Valid Diagnosis in High School Composition*. (Contributions to Education, No. 230. Bureau of Publications, Teachers College, 1926)

### 1. Development of Certain Powers of Expression

Development among pupils of certain powers of expression involves such objectives as the broadening of pupil interests and appreciations through observation and evaluation of experience; the development of clear, orderly thinking; the promotion among pupils of the power to organize and express their ideas effectively for others; the development of an increasingly adequate vocabulary, the improvement of pupil ability in those uses of English necessary to the everyday intercourse of the social and business world; and, for those especially gifted, the development of power in voluntary creative writing.

*Composition Scales.* In determining the extent to which these objectives have been realized, the teacher has at his command a series of composition scales, some designed to measure general merit in composition, others concerned with breaking up the art of writing into its component parts, and still others intended for use in specialized types of writing. The *Hudelson Typical Composition Ability Scale*, which calls for the reproduction of the story of the snowball fight on Slatter's Hill, is useful for determining the average level of performance of the pupils in a given class.<sup>1</sup> Better for getting at individual differences—that is, for determining the height and depth of performance within the group—is the *Hudelson English Composition Scale*, requiring pupils to write an original composition on the subject, "My Most Exciting Ride." Trabue's *Nassau County Supplement to the Hillegas Scale* is another useful instrument for general diagnosis.

*Diagnostic Scales.* After determining whether or not his pupils are up to general standards for their age, grade, and ability, the teacher wishes to discover those elements of strength and weakness in composition revealed by the so-called 'diagnostic scales'; that is, those which aim to break up composition into its component parts, in an effort to discover the relative strength and weakness of pupil performance in each of them. The *Harvard-Newton Scale* differentiates the forms of discourse and aids the teacher with statements of merits and defects, calling attention to relative strength and weakness in form and con-

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<sup>1</sup> Best known general merit scales include the following:

Courtis's Standard Research Tests in English Composition, Grades 2-12 (S. A. Courtis, Detroit); Hudelson's English Composition Scale, Grades 4-12 (World Book Co.); Hudelson's Typical Composition Ability Scale, Grades 1-16 (Public School Publishing Co.); Trabue's Nassau County Supplement to the Hillegas Scale for Measuring English Composition, Grades 4-12 (Teachers College, Columbia University).

tent.<sup>1</sup> Willing's scale also differentiates between 'story value' and 'form value,' proposing a formula for averaging the two. The most completely diagnostic scale in print is the Van Wagenen *English Composition Scale*, with separate measures for narration, description, and exposition. Within each scale, compositions are given separate ratings for *thought content*, *structure*, and *mechanics*, by means of which the relative strength of pupil themes in each of these elements may be determined. Professor Van Wagenen has assisted the scorer by analyzing *thought content*, for instance, into its component parts in each form of discourse. For narration, he defines it in terms of (1) "sufficient explanation of the situation, (2) naturalness and appropriateness of dialogue (if used), (3) clear progress of narrative to a definite conclusion; (4) use of suspense or surprise, (5) descriptive touches, (6) adequacy and variety of diction"; and for exposition, as (1) "adherence to the subject, (2) interest in treatment, (3) continuity of thought, (4) clearness of perception, and (5) discrimination in the selection of words."

Analysis of factors involved in good and poor writing among pupils is the subject of earnest inquiry at the moment in several parts of the country. Notable possibilities for objective treatment of the problem would seem to lie in such instruments as the Carroll Prose Appreciation Test, in which four passages descriptive of like subjects are presented, varying from the sentimental, ineffective, and non-specific selection to one of concrete expression and imaginative quality.<sup>2</sup>

Recent emphasis upon functional centers of expression reveals the need of additional scales for the measurement and diagnosis of difficulty in the more specialized forms of composition. The *Lewis Scale for Letter-Writing* and the *Minneapolis Scale for Letter-Writing in Grades Three through Six* are illustrations of forms available for one of the special fields.<sup>3</sup> The *Stewart Scale for Evaluation of News Stories* shows a similar trend in measurement.<sup>4</sup>

<sup>1</sup> Best-known diagnostic scales include the following: Ballou's Harvard-Newton Scales for the Measurement of English Composition for Grades 9-12 (Harvard University Press); Willing's Scale for Measuring Written Composition, Grades 4-9. (Public School Publishing Co.); Van Wagenen English Composition Scales, Grades 4-12. (World Book Co.).

<sup>2</sup> Carroll Test of Prose Appreciation for Junior and Senior High Schools. (Educational Test Bureau, Minneapolis and Philadelphia.)

<sup>3</sup> E. E. Lewis, Lewis Scale for Letter Writing. (World Book Co.) Minneapolis Letter-Writing Scale (Bulletin No. 6, 1925. Minneapolis Public Schools).

<sup>4</sup> Marietta Stewart, "A scale for measuring the quality of conventional news stories in high-school journalism." *The English Journal*, 23: March, 1934, 209-215.

It is curiously interesting, however, that two experimental evaluations of available composition scales agree in their discovery that scales based upon specialized types of writing and upon different forms of discourse render less reliable judgments than do the general merit scales. For purposes of diagnosis, however, the Van Wagenen instrument, though more costly of time, appears to be the most useful of the composition scales.

In spite of the presence of an occasional scale for specific functions in English, teachers and pupils will find it necessary to resort, in the case of certain expressional modes, to the use of subjective questions as a guide to evaluating pupil products. In conversation, for instance, some such list as the following is useful:

1. Was the conversation interesting to the listeners? To the conversers?
2. Were the conversers well informed?
3. Did they have worthwhile things to say?
4. Were the speakers courteous to one another?
5. Did each person in the group contribute something?
6. Did the pupils have words to express their ideas well?
7. Were their sentences clear-cut and forceful?
8. Did the audience listen attentively?

*Verse.* Efforts to evaluate pupil verse have proved discouraging, so far as uniformity of judgment is concerned. As in the general field of composition, there are those who think measures of creative writing will take into account general merit alone. There are others who hope for diagnostic instruments capable of revealing elements of strength and weakness in pupil verse.

*Speech.* Diagnosis of speech difficulties, with their manifold psychological and physiological bases, is discussed elsewhere in this yearbook. Although for the most part analysis of speech defects is the work of the specialist in a laboratory, much can be done by the teacher in the classroom to note progress and diagnose difficulties in oral expression. The same need for objective standards and the same analysis of the problem into thought content and organization with their attendant technical skills are necessary here as in the field of written composition. Development of more objective scales for the rating of oral composition has been attempted by Stinchfield, Stevens, Knower,<sup>1</sup> and others. By means of aluminum disc records, workers in the field

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<sup>1</sup> F. H. Knower. "A suggestive study of public speaking rating scale values,"

of speech have analyzed carefully such factors as pitch range and variation, intensity of tone, rate of speech as indicated by the duration of pauses and phonations, loudness variations, articulation, enunciation, and quality of tone. Results of these studies, together with others in the field of breath control, are sufficiently non-technical to be applied by the teacher in the classroom. Emphasis in recent research upon the measurement of effective speech in terms of audience reaction is especially significant in calling the attention of teachers and pupils alike to the ultimate test of all speech, the effect produced upon the listener.

*Improving Techniques.* The teacher, faced with the problem of getting at specific difficulties, complains frequently that the composition scale is too general to ferret out the detailed problems demanding remedial treatment. Workers in the college field have been alert to the need of segregating the various elements of composition for individual consideration. For instance, if we wish to test skill in organization and presentation of ideas, we should control the content.

An interesting illustration of the technique proposed is the use of the motion picture in the Placement Examination given to freshmen at Ohio State University. A picture is presented, for instance, showing a woman in the act of buying an article in a dry goods store. She questions the salesman, who offers certain assurances concerning the goods under consideration. When the material is delivered, several defects are evident. It is not as the salesman had promised. Having followed the situation in detail, the students are then asked to write the letter of complaint that the purchaser sent to the dry goods store. Every one has an equal chance so far as the content of the letter is concerned. The test is one of presentation of ideas and command of the processes of writing.

The same procedure occurs in the University of Chicago Qualifying Examination. In a question designed to test the student's ability to marshal evidence from various sources and to present it coherently to others, there are printed a number of quotations about a given writer from the field of literary criticism. The student is then asked to prepare a critical estimate of the writer's work, making use of the materials furnished, and acknowledging sources of quotations according to the tenets of reporting research.

Willing similarly found the furnishing of the outline of a story for

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*Quarterly Journal of Speech Education*, 15: Feb., 1929, 30-41. W. A. D. Millson. "Problems in measuring audience reaction." *Quarterly Journal of Speech Education*, 18: Nov., 1932, 621-636. E. Murray and J. Tiffin. "An analysis of some basic aspects of effective speech." *Archives of Speech*, 1: 61-83.

junior-high-school pupils a valuable means of testing their ability to present ideas. The procedure eliminated borrowing of vocabulary and phrase, and also of imaginative conception, both of which he asserted accompanied the use of mere reproduction of a story read.

Professor Stalnaker proposes, for purposes of measurement, to break up into its specific parts such a process as the orderly presentation of ideas: (1) ability to express clearly one's purpose in presenting the ideas, (2) ability to separate relevant from irrelevant materials, (3) ability to recognize proper coördination and subordination of ideas; and (4) ability to arrange ideas in proper sequence. The following illustrations show how he attacks the problem of measuring these abilities in the University of Chicago tests:

Test A presents a composition purpose: *To show why the price of tobacco today can be said to be unreasonably high.* Underneath this statement of purpose are nineteen different sentences, some of which are totally irrelevant to the topic. The test is to check the irrelevant items. A similar procedure adapted to the elementary-school level is found in the final section of the *Iowa Elementary Language Tests*.

Test B presents ideas in a sentence outline form with the following instructions: to indicate each statement, major or minor, that is relevant to the purpose expressed, that is out of its proper position in the outline, or that is wrongly coördinated or wrongly subordinated.<sup>1</sup>

Still another section furnishes an outline form with three degrees of subordination, into which are to be written the twenty-one sentences on the opposite page.

Eurich,<sup>2</sup> at the University of Minnesota, has prepared similar tests, furnishing a series of topics in scrambled order, but leaving the student to prepare the outline form.

Both Eurich and Stalnaker have experimented with paragraphs in which sentences in scrambled order are to be numbered in proper sequence. The former, in his *Coöperative Contemporary Affairs Test*,<sup>3</sup> has attempted to measure also the ability to sense relationships and to draw conclusions. Though adapted in content and difficulty to college students, the technique could be applied at the elementary-school level.

<sup>1</sup> J. M. Stalnaker. "Testing the ability to organize." *The English Journal* (Col. Ed.) 22: Sept., 1933, 361-367.

<sup>2</sup> A. C. Eurich. "Measuring the achievement of objectives in Freshman English," in *Studies in College Examinations*, University of Minnesota, 1934.

<sup>3</sup> A. C. Eurich and E. C. Wilson, *Co-operative Contemporary Affairs Test* (Provisional form, 1934). Co-operative Test Service, Teachers College, Columbia University.

For qualities of effective style and of originality and imaginative concept there are no measures at the moment. Tests for the appreciation of poetry and prose deal with such elements as suggestive versus prosaic diction, originality versus triteness in conception, and the use of concrete versus general detail. The process is one of placing together for pupil consideration contrasting illustrations from their own writing and that of others. Both as a test procedure and as a remedial measure, the device is a simple and useful one for the stimulation of interest in effective expression. The *Carroll Test of Prose Appreciation* illustrates the use of the device at the high-school level.

Much more has been done in the field of reading vocabulary than in that of the speaking or writing vocabulary. Use of the vocabulary test in any of the well-known survey batteries will aid the teacher in detecting individual weaknesses in extent of word knowledge.

As a result of such a survey of the abilities of her class in composition, the teacher will be faced with an array of defects somewhat like the following:

1. Lack of purpose or motive
2. Lack of ideas
  - a. Insufficient detail
  - b. Failure to sense what interests others
  - c. Inability to gather ideas about a topic of interest
3. Incoherent presentation of ideas
  - a. Inability to stick to the subject
  - b. Failure to sense logical relationships between ideas
4. Weakness in beginning or ending
  - a. Failure to arouse interest in the opening sentences
  - b. Failure to sustain interest to a high point in the end
  - c. Inability to hold suspense in story-telling
5. Lack of imagination and originality in building up interest
6. Inadequate vocabulary for the purpose
  - a. General lack of words
  - b. Lack of variety in diction
  - c. Careless choice of words
7. Undue repetition of words or ideas
8. Lack of force and convincingness of expression
9. Lack of effective use of the sentence
  - a. Rambling, stringy, ununified sentences
  - b. Short, choppy sentences
  - c. Incoherent sentences
  - d. Monotonous sentence patterns

Bases for many of these weaknesses have already been suggested in the analysis of the mental, physical, environmental, and learning factors in the situation. In them and in other elements that the teacher will discover lie the suggestions for remedial treatment. Back of much

of the difficulty is lack of vital expressional situations. The teacher will aim to utilize, in making composition meaningful, every expressional situation that the school day offers.

The teaching of announcements will parallel the need for the making of announcements in school activities, and the success will be measured, not in terms of teacher marks, but in terms of the effect of the final announcement upon an actual audience. Letters will be written and sent, for purposes which abound in the activity program of the school. Every subject of study utilizes English as a tool, affording the richest of opportunities for the development of language skills.

For instance, a group in social studies wishes to present for the rest of the class a program revealing life in the early pioneering days of the Ohio and Mississippi valleys. Many questions arise for answer: How did men earn their living? Where did food come from? What games did the children play? What educational facilities were there? Where did they get their furniture? What housekeeping conveniences were there? How did the women spend their time? How did the children help? What were the means of transportation? Immediately in the facing of questions like these, pupils learn their first lesson in the necessity of planning the presentation and organization of ideas. Which topics group themselves naturally together? Which should come first? Which last? and so on. A rich environment is established in the classroom. Interviews with old settlers are planned. Exhibits are prepared. Much reading is done, and varied excursions taken.

By such means will the teacher plan remediation of two of the most vital difficulties in composition, lack of something to say and lack of motive for saying it.

At the same time, the teacher will utilize all resources at his command to probe the experiences of the individual boys and girls that they may make special contributions growing out of their individual environments.

Another principle important in remedial work is that pupils should be aided by class help and preparation *before* writing or speaking. English is a laboratory rather than a recitation subject, which demands much planning together, gathering of ideas, and discussing of the arrangement of them before the pupils are asked to write or to present ideas formally in speech.

For attack upon related problems of good beginning and ending and the like, the teacher will find the use of self-help questions of value both

for the individual pupil *before* speaking or writing, and for evaluation by the reader or listener after the composition has been shared. Emphasis throughout should be upon the social sharing of the experience.

If my purpose is to make my story interesting to the listener, the following questions are important guides: (1) Have I kept the secret till the very end? (2) From the opening sentence on, have I made the listener want to know how the story turns out? (3) Have I told all the details the listener needs to understand the story? (4) Have I told them in the right order so that each grows out of the one before it? (5) Have I planned to stop the moment the story is finished? (6) Have I used concrete words which help the listener see what I saw?

It is obvious how helpful is the linking of reading experiences with writing and speaking, fostering among boys and girls an appreciation of successful attempts on the part of writers to do the things that they themselves are attempting.

After the use of such devices as these, pupils may with profit evaluate test compositions of their own by one of the scales used in the diagnosis for the discovery of points in which they have improved through remedial work. Exercises such as Stalnaker proposed for the measurement of ability to present ideas coherently may be valuable for occasional practice as well as for testing purposes.

Inadequacies in vocabulary may be dealt with both through exercises in vocabulary-building and through arousing an interest in the most expressive word for a given purpose in the actual experience of writing.

Henry writes of the rush of the boys at camp for the dining room at the sound of the dinner gong: "When the bell rang, the boys went up to the dining shack for dinner." *Went* is a colorless word. Wrestling with the problem of finding the best word to picture the experience is much more meaningful in the process of sharing the scene with others than it would be in an exercise book on vocabulary building. They *rushed*, *dashed*, *capered*, *raced*, *hurried*, *somersaulted*, *jostled*, and so on, according to the picture each child sees. Listing on the board a dozen such suggestions and then selecting the best one for the place is a salutary exercise in vocabulary-building, because it links the knowledge of the word with a sense of its *value* in an actual expressional situation.

The problem of the development of *power* in composition has been dealt with at some length chiefly because it is often overlooked in the

effort of teachers to secure mechanical accuracy and grammatical correctness in pupil speech and writing.

## 2. The Development of Skills in the Mechanics of Expression and Habits of Correct Usage

The problem of the diagnosis of difficulty and the planning of remedial instruction in the mechanics of composition involves such objectives as are listed in the outline in the early pages of this chapter: adequate sentence sense, mastery of the commonly accepted forms of capitalization, punctuation, and correct grammatical usage, and ability to write legibly and spell correctly words in ordinary use.

A preliminary study of what is correct usage, what words are in common use, and similar related problems is necessary to an intelligent approach to the problem of diagnostic and remedial teaching. Perhaps the two most fertile sources of evidence on these points are the *Lyman Summary of Investigations*, which includes a discussion of the Leonard study, and the *Third Yearbook of the Department of Superintendence*, which reviews the backgrounds of curriculum-making in the elementary school.

*Locating Difficulties.* Four methods of getting at pupil difficulties in the mechanics of expression have been commonly used by teachers: (1) compilation of pupil errors in oral English heard in the classroom or on the playground; (2) analysis of pupil errors in composition; (3) the personal interview for conference concerning the causes of error in composition; and (4) the use of survey and diagnostic tests.

Recording of pupil errors in oral English in the classroom has been of value chiefly in its effect upon the teacher's attitude toward the language program. It has focussed attention upon the practical problem of stressing those errors which pupils actually make. Such a procedure has proved most successful where check lists for recording errors have been prepared and categories agreed upon in advance. It has also proved most useful in free-activity periods, when a civic meeting is in progress, or under circumstances where evidences of restraint are removed, and the errors made are more truly representative of the pupils' natural speech than are the more stilted and brief responses of the recitation.

The difficulty of securing an accurate picture of individual language patterns has already been stressed. The danger of the teacher's ignoring problems of sentence structure in his interest in specific errors in usage has also been pointed out.

For the objective recording of pupil use of language, noteworthy is the invention at the University of Iowa of a recording apparatus for reproducing the actual oral discussion of the classroom.<sup>1</sup> The apparatus, recording with 99.8 percent accuracy, as contrasted with 84.9 percent for court reporters, presents a complete picture of the use of oral English, including inflection, rate of production of speech sounds, and the presence of such non-verbal language sounds, *um*, *uh*, etc. The possibilities of the device are varied and most interesting.

Analysis of pupil problems in the mechanics of composition is perhaps best illustrated by Willing's study, for which he prepared the most detailed error guide that has yet appeared in print.<sup>2</sup> By means of such a guide, simplified to meet the needs of the class under consideration,

#### SELF-CHECKING LIST

#### Score Points for Friendly Letter

	<i>Points Pupil's Score</i>
1. Space at top of paper .....	1
2. Half inch margin at left of paper .....	1
3. Space between heading and greeting, or salutation .....	1
4. Space between greeting and body .....	1
5. Space between paragraphs .....	1
6. Space between body and ending or closing .....	1
7. Space between closing and signature .....	1
8. No erasures, blots, or soiled places .....	1
9. Penmanship legible .....	3
10. Heading at right hand side of paper .....	1
11. No end punctuation, 1st line, 2nd line, 3rd line .....	3
12. Heading on three lines .....	1
13. Heading in right order .....	1
14. Comma after name of city .....	1
15. Comma after day of month .....	1
16. No unnecessary punctuation in heading .....	1
17. No capitals omitted in first line of heading .....	1
18. No capitals omitted in second line of heading .....	1
19. No capitals omitted in third line of heading .....	1
20. Salutation even with margin .....	1
21. Comma after salutation .....	1
22. First word of ending capitalized .....	1
23. Comma after ending .....	1
24. First and last name given in signature .....	1
25. Signature at right and on line below the closing .....	1
Total .....	31

<sup>1</sup> H. A. Greene and E. A. Betts. "A new technique for the study of oral language activities." *Elementary School Journal*, 33: June, 1933, 753-761.

<sup>2</sup> M. H. Willing. *Op. cit.*, pp. 55-63.

both teacher and pupils may check individual errors in composition at intervals throughout the term. What such an analysis invariably shows is a few errors repeated over and over again, a discovery of vital significance in the diagnosis and remediation of error. The check sheet shown, by means of which pupils in the Tuttle Elementary School, in Minneapolis, are taught to record their own errors, illustrates the idea.

Pressey<sup>1</sup> has gone a step farther in the application of the interview technique to the evidence thus found. The purpose of such an interview is to locate the underlying psychological causes of error. "Why," asked the teacher, "did you capitalize this word?" Replies of the children were of great value in improving the method of instruction. Most errors were found to be due not to carelessness or chance, but to specifically conceived notions of the child, as, for instance, those revealed in the questions of pupils concerning the reason for certain matters of current usage: "If important words of a title are capitalized, why not important words in sentences? If God is capitalized, why not what he does? If certain groups like Jews and Methodists are capitalized, why not pirates and lawyers?" The whole technique of the interview as a device for the psychological diagnosis of difficulty is a center of interest at the moment and fraught with great possibilities for the future.

A fourth method of locating sources of error in pupil speech and writing is the use of the survey and diagnostic test. If, by administering a standardized test or two at the beginning of the year, a teacher could discover the kinds of mistakes made by pupils in written composition, much time and labor could be saved. In a thorough-going study of the problem Willing<sup>2</sup> compared the results of sixteen formal tests with those of eight compositions from each pupil in Grades VIII and IX of the Lincoln School of Teachers College. Errors in both types of material were tabulated by means of his error guide, including spelling, capitalization, punctuation, grammar, sentence structure, and word usage. Significant findings are: (1) comprehensive tests in proof-reading and in recognition of errors are reasonably good instruments for predicting the average number of formal errors that pupils will make in 1200 words of composition; (2) there is little choice between the different types of tests for this kind of prediction; (3) unweighted composite tests in punctuation, sentence structure, and grammar and word usage show higher validity than do any of the single tests repre-

<sup>1</sup> S. L. Pressey and P. Campbell. "The causes of children's errors in capitalization." *The English Journal* (H. S. Ed.), 22: March, 1933, 197-201.

<sup>2</sup> M. H. Willing. *Op. cit.*, p. 33.

senting the same categories of errors; (4) tests seem to be of doubtful value in forecasting the specific kinds of errors individual pupils will make in composition writing.

A second experiment by Willing<sup>1</sup> revealed the relative value of an original composition, a reproduction of a story, and a proof-reading test involving correction of a faulty composition containing 180 errors of 85 different kinds. The test in the correction of errors proved to be a "more comprehensive instrument for revealing weaknesses in proof-reading than is a simple original composition or reproduction for revealing weaknesses in the formal elements of composition." The compositions revealed twelve types of error per pupil; the proof-reading exercise, an average of fifty-nine. On the other hand, Willing's previous study suggests that the specific types of errors revealed by a proof-reading test may not be those inherent in the actual writing of the pupils.

Other studies by Willing make it obvious that a comprehensive diagnosis of difficulties in English demands both a testing program and the analysis of errors in pupil speech and writing.

The tests available are of two kinds: first, general survey tests of language ability, such as *The Iowa Elementary Language Test*, the *New Stanford Language Test*, and the *Minnesota Unit Scales of Attainment*, in which general areas of the language problem are surveyed for discovery of categories of error; and second, diagnostic tests such as the *Los Angeles Diagnostic Tests in Language* and the *Leonard Diagnostic Test in Punctuation and Capitalization*, in which minute examination of a small area makes possible detailed analysis of difficulties within it.

Both in the selection of tests now on the market and in the construction of tests of his own, the teacher will have constantly in mind certain problems in the testing of language usage or manuscript form. The success of his diagnosis depends in the final analysis upon the validity and reliability of the instruments at his disposal. It goes without saying that he will satisfy himself concerning the reasonableness, the cruciality, and the current acceptability of points in language usage tested by the examination. Beyond that, five problems arise in connection with the choice or preparation of tests for purposes of diagnosis: (1) the possibility of variation in results depending upon the nature of the test used, (2) the adequacy with which the test samples the area of difficulty, (3) the frequency of appearance of a given item, (4) the extent to which

<sup>1</sup> M. H. Willing. "Individual diagnosis in written composition." *Journal of Educational Research*, 13: Feb., 1926, 77-89.

the correct response indicates proficiency in the use of the item in natural language situations, and (5) the extent to which errors made upon test items are identical with those made in free writing.

Correlations between results of varied types of examinations have been found to lie somewhere between .40 and .60, most of them between .40 and .50, as for instance between choice of two forms and the correction of a wrong form, or between correction of a wrong form and the filling in of a blank. Similar low correlations exist between results of proof-reading and dictation exercises in which the same items of punctuation are tested.

Limitation of sampling is a second important factor affecting both the validity and the reliability of diagnosis. It is essential that the teacher know to what extent the test he selects for diagnostic purposes really covers all possibilities for error or a representative sampling of them in the field under consideration.

A striking illustration of this problem appears in the report of O'Rourke's recent survey.<sup>1</sup> The element being tested was ability to avoid the double negative. The area was found to contain at least seven different examples of the same general problem, results of which in seven fourth-grade classes and six fifth-grade classes were as follows:

Example	Number of errors from 506 papers
1. <i>Was none</i> versus <i>wasn't none</i>	300
2. <i>Never gives to any</i> versus <i>never gives to none</i>	41
3. <i>Isn't anyone</i> versus <i>isn't no one</i>	56
4. <i>Is scarcely</i> versus <i>isn't scarcely</i>	327
5. <i>Can't find anything</i> versus <i>can't find nothing</i>	79
6. <i>Oughtn't ever</i> versus <i>oughtn't never</i>	337
7. <i>Can hardly</i> versus <i>can't hardly</i>	327

Obviously no one of these errors can be selected as a valid test of a general skill called 'ability to avoid the double negative.' Diagnosis of difficulty depends upon the appearance of each situation in the test used.

Validity of diagnosis and likewise its reliability depend also upon the frequency of appearance of a single item within the test used. Errors detected on the basis of one or two appearances of an item in a given test may or may not be due to carelessness. Pupil performance may also be affected by the manner of statement within a given test item.

<sup>1</sup> L. J. O'Rourke. *Op. cit.*, p. 13.

A recent study of the results of the Iowa Placement Tests among freshmen at the University of Minnesota showed the following proportions of correct responses on different sentences involving the same point in usage.

Sentence No.	Sentence	Percent Correct	Rank in 50 Items
16	Last year the Girls' Glee Club of Vassar College sang there.	77.01	25
22	I have always been interested in boys' clubs	93.07	4
32	The boy's secretary at the Y.M.C.A. was a famous college athlete.	57.21	47

Had but one illustration of the use of the possessive plural been used in the test, the rank order of correctness in a group of fifty items would have been four in the case of Sentence 22; twenty-five in Sentence 16; and forty-seven in Sentence 32.

What frequency of appearance is necessary is a matter of conjecture at the moment. Briggs, in his test of English form, tests each of seven principles of capitalization and punctuation five times in a 35-point test. Leonard presents twenty-six principles four times each in the *Leonard Diagnostic Test in Punctuation and Capitalization*. The *Los Angeles Diagnostic Tests in Language* likewise test each point several times.

Still another factor influencing the validity of diagnosis is the extent to which correct responses in a test indicate proficiency in the use of the same items in a non-test situation. Some experimenters in testing have attempted to meet this problem by constructing instruments that approximate as closely as possible the actual language situation, and by avoiding such artificial exercises as demanding merely a choice of two given forms. Illustrations are found in the *Clapp Test for Correct English*, in Leonard's *Wisconsin Test of Grammatical Correctness*, and in the *Coöperative Research Language Test* by Carpenter, Lindquist, Paterson, and Beers.

Most tests which are truly diagnostic are accompanied by diagnostic charts like the following:

Nature of Error	Pupils	Henry	John	Grace	Helen	William	Leonard
1. There were	X	X		X	X	X	X
2. He seen				X			
3. Having come, the house looked		X					
4. He had froze	X						X
5. Invited he and I		X			X		X

Having checked in this fashion the errors of individual pupils, the teacher is in a position to determine by a glance across the horizontal lines which errors are of general enough occurrence to demand class treatment, and by comparison with the vertical columns, which should be attacked by individual or small group drill. Evidence points to the fact that most errors are subject to correction in small groups or by individuals rather than by classes as a whole. In the preparation of drill materials, the same principles hold as were presented for the evaluation of tests; namely, that those drill exercises are best that (1) sample the area of difficulty most thoroughly, (2) present the largest number of possibilities for practice upon individual items, (3) approximate most nearly the natural language situation, and (4) provide for carry-over into the functional uses of language.

Certain facts concerning remedial teaching have been established experimentally. (1) Since sound plays so large a rôle in errors in usage, *oral* drill should constantly supplement the written exercise (2) The more methods of attack the teacher can use, the better are the results. (3) The more initiative the pupils take in the overcoming of their own errors and in the planning of their own remedial programs, the quicker the elimination of error. (4) Drill upon specific points of error is the greatest single factor in producing results. (5) Motivation of the problem through charting of errors, urging improvement, and keeping of progress scores may, however, reduce the drill necessary by one-half. (6) Language games, in at least one experiment in the sixth grade, proved the least effective of six methods of attacking errors. Their value appears to be in direct proportion to the frequency of repetition of the usage in question and the naturalness of the language situation involved. (7) Mere repetition of correct forms, unaccompanied by consciousness of the wrong form to be avoided, has been proved ineffective when compared with methods placing right and wrong in juxtaposition. (8) Individualized drill upon errors made is notably more effective than putting all pupils through the paces required by the course of study, whether they are in need of drill on every point or not.

It is important to remember that drill books that give five drills on each of fifty points are of vastly greater value than those which furnish one exercise on each of two hundred fifty. Better still are those that graduate the amount of drill in terms of the difficulty and cruciality of items under consideration. Teachers should bear in mind in making use of the drill book that *oral repetition* of correct forms after the exercise is complete adds in some cases fifty percent to the chances

of permanent retention. Constant care should be taken also to insure carry-over from the drill situation to the use of these elements in daily speech and writing. That such transfer does not happen unaided has been demonstrated in schoolroom practice for years.

To what extent grammatical knowledge helps in the elimination of error is unknown at the moment. The burden of proof rests with those who believe that it functions in the actual improvement of usage.

General principles of drill mentioned in the preceding paragraph apply equally to correct usage and to capitalization and punctuation. In addition, the latter have certain problems peculiarly their own. Both are *writing* skills. Oral recitation on points in capitalization and punctuation would seem to have slight justification, especially if the child is permitted to read in such illogical fashion as this: "John comma my cousin comma has come to visit us." The principle the exercise is trying to fix is much more logically emphasized in the explanation: "I put commas around *my cousin* to separate it from the rest of the sentence because it is an appositive modifier that interrupts the thought."

Capitalization and punctuation are used in two ways: one, in the act of writing, and the other, in the act of proof-reading. Drills in both should be furnished. The efficacy of dictation, proved exceedingly valuable in France and England, should not be ignored in the excessive use of the printed drill book.

It is especially necessary in these two skills to furnish drills that actually map the area of difficulty. The use of the capital with the proper and not with the common noun is illustrated frequently in our textbooks, but the problem, already proved to be a major source of error, is much more complex than one of personal and place names. The seasons, sections of the country versus points of the compass; titles of firms and organizations versus common nouns like *company* and *school*; names of family relationships, such as *aunt*, *uncle*, *mother*, and *father* — these and a host of other specific situations reside in the apparently simple statement that "names of particular persons, places, and things are capitalized."

The name of the person addressed is one punctuation problem at the beginning of the sentence, another at the end, and still another in the middle. Adequate sampling of the whole field is therefore requisite to effective drill.

It has been suggested elsewhere in this chapter that the interview technique of getting at the cause of pupil errors in English is especially

effective in the fields of capitalization and punctuation. Learning from boys and girls *why* they use capital letters and punctuation marks as they do is a fundamental basis of methodology in the elimination of error.

*Spelling and Writing.* Among the most important elements in the mechanics of English are the processes of spelling and handwriting. The objectives of both have broadened within the last few years. The first is to give boys and girls the ability to write legibly according to accepted standards of social and business usage and to spell accurately words in common use. The second is to make them conscious of their own deficiencies and capable of attacking on their own initiative the problem of improvement. The third is to instill in them a spelling and writing conscience that will insure the carry-over of these skills to all the writing activities of life both within and without school. Involved in the latter are attitudes and in the former habits of work that will be dealt with in a later section of this chapter.

Analysis of pupil difficulties in spelling and handwriting has advanced further than that in any other field of expression, largely because the psychological factors involved are definitely known. Process analysis, which has been of signal value in arithmetic, is available as an aid to the teacher in both these fields. Freeman,<sup>1</sup> for instance, analyzes the process of handwriting into five elements: uniformity of slant, uniformity of alignment, quality of line, letter formation, and spacing. Gray<sup>2</sup> adds heaviness, size, and neatness, and gives separate consideration to spacing of lines, words, and letters. Formation of letters, he likewise divides into five types of problems. Miss Nystrom's program<sup>3</sup> recognizes seven significant elements: color, size, slant, letter spacing, beginning and ending strokes, word spacing, and alignment. For each of these, she shows at least four distinct types of difficulty. All recognize back of these specifics the principles of rhythm, movement, speed, and position.

Methods of diagnosis and remediation in the field will be discussed under habits of study.

Ability to spell correctly involves visualization, pronunciation,

<sup>1</sup> F. N. Freeman. *Freeman Chart for Diagnosing Faults in Handwriting* (Houghton, Mifflin Co.).

<sup>2</sup> C. T. Gray. *Standard Score Card for Measuring Handwriting* (Bulletin No. 37, University of Texas, July, 1915).

<sup>3</sup> E. C. Nystrom. *Nystrom Self-Corrective Handwriting Charts* (Farnham Press, Minneapolis).

knowledge of meaning, word analysis, letter sequence, and ability to write accurately the letters involved.

The teacher's first problem is to discover by the use of standardized and curriculum tests the pupils in the class who are below average for their grade. Segregating for special testing the various factors listed above, she then discovers the nature of the difficulty demanding correction.

Book and Harter,<sup>1</sup> studying pupil errors in spelling, grouped them as follows.

*Errors Due to Inadequate Mental Control over Known Words*

*Type of Error*

*Illustration*

**1. Omission	the for they
2. Anticipation	conversation for conversation
*3. Repeating or adding a letter	theeth for teeth
*4. Transposition	esaily for easily
**5. Carelessness	surlly for surely
6. Doubling wrong letter	speel for spell
7. Interference	swap for soap
8. Forgetting the word	Arthur for author
9. Substitution	dod for dog

*Errors in Words not Learned*

**1. Phonetic spelling	Wensday
2. Mispronunciation	chimley
3. Alternatives	ei or ie confused
4. Doubling	Hellen for Helen
5. Non-doubling	galons for gallons
6. Substitution of similar letters and syllables	goiny for going
7. Homonyms	bare for bear
*8. Ignorance of word	parell for parallel
*9. Failure to hear or perceive word correctly	bureau for mural

Elements double starred are especially troublesome in every grade and those single starred are second in frequency. By means of an analysis such as this the teacher and the older pupil himself can classify errors for specific remediation.

Studies of pupil difficulties in spelling agree that poor handwriting, lapses due to carelessness, faulty pronunciation, and failure to associate the sound of letters and syllables with the spelling of words are major causes of error in spelling. Lack of motivation and poor habits of work are likewise important contributors to failure. Specific factors that have been determined by research are these: (1) the greatest source

<sup>1</sup> W. F. Book and R. S. Harter. "Mistakes which pupils make in spelling." *Journal of Educational Research*, 19: Feb., 1929, 106-118.

of error comes slightly to the right of the middle of the word; (2) the most difficult letters are *a*, *e*, *i*, and *u*; (3) a relatively large percentage of errors is phonetic; (4) omissions include commonly the second of a double letter, final letters, silent letters, key consonants, and central syllables; and (5) one vowel is more or less frequently substituted for another in the second syllable of words.<sup>1</sup>

For purposes of testing in spelling, there are available for the teacher three kinds of tests. By means of survey tests like the *Ayres*, the *Iowa Spelling Scales*, the *Monroe Timed Spelling Test*, and the *Morrison-McCall Spelling Scale*, the child's general proficiency for his grade may be determined. By the use of curriculum tests, his mastery of the words taught is measured, and by means of learning tests (words he has not yet studied), his ability to attack new words, to transfer learning from earlier situations, and to apply effective habits of study to the mastery of spelling problems. In the latter, his progress is indicated by the difference in his score at the beginning and end of a ten- or fifteen-minute study period.

Scientific investigation on methods of remediation in spelling has yielded many facts. We know that the problem is one for individual attack. Each pupil should be conscious of his own spelling problems as revealed by pretests and diagnosis like that of Book and Harter. Each pupil should be encouraged to exercise his own initiative in overcoming his individual spelling errors and in recording and charting his progress from day to day. Best methods of learning new words should be discussed in detail: the importance of pronouncing the word correctly, of associating the sound of the syllables with the proper spelling of them; the necessity of seeing the word accurately, of noting its division into syllables and the shorter familiar words of which it is composed; the value of knowing what the word means, of being able to use it in a sentence; and finally, the importance of writing the word with care and accuracy.

Recent investigations suggest that there may be no one best method of attacking new words. Superior spellers, however, have best methods they have worked out for themselves by some combination of the elements listed above. Poor spellers tend to random, ineffective attack upon the problem.

Marking for children the 'hard spots' in given words is probably more of a hindrance than a help unless the spots have been determined

<sup>1</sup> J. E. Mendenhall. *An Analysis of Spelling Errors* (Bureau of Publications, Teachers College, Columbia University, New York, 1930).

by pretest to be the source of error for many in the class. That the 'hard spots' differ for different people is well known.

The extent to which spelling rules are of value is an open question at the moment. That some of them involve so few words and so many exceptions as to be of little help is an established fact. Those relating to the joining of syllables, such as the dropping of final *e* or the doubling of a final consonant, appear to be more useful than others commonly taught.

It is a truism, of course, that frequent opportunity for the writing of words learned should occur in the free and prescribed writing of pupils. Carry-over into such situations should be set up as the ultimate test of success in spelling.

### 3. Development of Desirable Attitudes, Appreciations, and Habits of Work

The evaluation of pupil behavior in terms of attitudes, appreciations, and habits of work is fundamental to a well-rounded study of the outcomes of the teaching of English; for the development of such factors as self-control, self-direction, self-appraisal, and ability to coöperate in a group is achieved through concrete classroom activities in the course of learning in the various subject-matter fields.

The teacher has at his disposal certain devices and methods that have proved useful in the observation and recording of pupil conduct; e.g., Collings's scale for measuring changes in purposive behavior,<sup>1</sup> the outline proposed by Anderson, Barr, and Bush,<sup>2</sup> for the guidance of supervisors in studying teaching, and helpful suggestions in the *Second Yearbook of the Department of Supervisors of the National Education Association*.

Many devices have been presented for observing and recording how individual pupils attack their problems. The Stanford Study-Habits Inventory prepared by C. Gilbert Wrenn<sup>3</sup> contains a series of thirty descriptions of study situations, habits, or attitudes to which the pupil is asked to respond in terms of their frequency in his experience, *Rarely or Never, Sometimes, and Often or Always*. Eurich<sup>4</sup> in his *Studio-*

<sup>1</sup> Ellsworth Collings and M. O. Wilson. *Psychology for Teachers* (Charles Scribner's Sons).

<sup>2</sup> C. J. Anderson, A. S. Barr, and M. G. Bush. *Visiting the Teacher at Work* (Appleton-Century).

<sup>3</sup> C. Gilbert Wrenn. *Study-Habits Inventory* (Stanford University Press).

<sup>4</sup> A. C. Eurich. "An analysis of self-ratings on studiousness traits." *Journal of Applied Psychology*, 14: Dec., 1930, 577-591.

*ness Rating Scale* proposes one hundred items with five choices in response: *Never, Seldom, Occasionally, Usually, Always*. Both these checklists, prepared for high-school or college students, are illustrative of a useful approach that could be adapted for the elementary level.

Morrison's technique for observing pupils at work<sup>1</sup> provides an attention profile for the class as a whole, together with a minute-by-minute profile for indicating the extent of sustained application on the part of the individual pupil. Such a device shows the teacher and pupil the extent to which he is able to concentrate upon the task in hand. Whether, when he does concentrate, he is approaching his problem in the best possible manner, is still to be determined.

That profitable use can be made of the interview method in studying the habits of work of successful and unsuccessful pupils by securing from them statements of what they do when they study or practice has already been demonstrated in the fields of handwriting and spelling.

Voluntary exercise of skills or activities beyond the required tasks is a significant index of pupil attitudes and purposes. To what extent do pupils within the group engage in writing or other activities indicative of carrying their interest beyond the classroom? Writing of diaries, original stories, poems, or dramatizations are illustrations in point. Writing letters to friends, to radio stations, to business firms or magazines are other activities found popular in studies of out-of-school writing of junior-high-school pupils. Voluntary preparation of neighborhood newspapers and of local performances in amateur theatricals are still other evidences of the carry-over of interests to activities outside the school.

The extent to which pupils apply the skills learned in English to all the writing and speaking activities of the daily program is another factor in the measurement of their progress. The use of the *Ayres Handwriting Scale* for the rating of papers prepared outside the class in writing is a case in point. The determination of the spelling coefficient for pupil compositions; that is, the number of misspellings and lapses per thousand written words, gives an objective measure of the extent to which pupils apply in actual writing situations what they have learned in spelling. The unified programs of work being developed in outstanding schools today furnish ample opportunity for the practice of the skills of expression in every phase of the school program.

The extent of responsibility pupils assume for self-criticism and

<sup>1</sup> H. C. Morrison. *The Practice of Teaching in the Secondary School* (University of Chicago Press, 1931, pp. 121-160).

direction is another fundamentally important measure of their achievement in English. To what extent does the pupil recognize and assume purposes of his own? To what extent is he capable of planning his own mode of attack upon these problems? To what degree is he able to diagnose his own difficulties and proceed with the remedying of them? That children are capable of doing more of this than their teachers have ever dreamed is demonstrated daily in schools that furnish them the opportunity. Simple diagnostic sheets for the checking of errors by the pupils themselves reveal clearly the points of needed emphasis. Graphic presentation, not only of progress in terms of total score, but also in terms of relative success on individual items, indicates frequently in color those elements which need further attention on the part of individual pupils. That certain boys and girls in the sixth grade can rate compositions with an accuracy equal to that of their teachers has already been demonstrated, as has also the vital effect upon progress that such use of scales in the hands of the pupils may have.

That such a procedure engenders interest and develops among pupils attitudes of coöperation and responsibility for their own progress is evidenced by a recent report in the *Hutchins Star* of the Handwriting Club of the Hutchins Intermediate School in Detroit: "At present we are engaged in the delightful task of scoring test papers written by the Eight B and Nine B classes. Afterward we shall display the best papers on the hall bulletin board in order to keep up the standard of good writing in the school. When we finish the work, we expect to develop a plan showing the vocational value of good handwriting."

Two outstanding examples of methods by which pupil self-criticism and evaluation have been developed in spelling and handwriting are seen in the Hamtramck plan<sup>1</sup> and the Nystrom charts.<sup>2</sup>

Causes for success or failure in the development of attitudes, appreciations, or habits of work lie, for the most part, in the factors discussed in the opening sections of this chapter.

Outcomes beyond the mastery of the day's lesson should be kept constantly before the pupils. Voluntary activities are both fostered and recognized in school displays of hobbies, informal sharing of experience in out-of-school activities through oral composition and

<sup>1</sup> H. Miller, S. A. Courtis, and G. Waters. *Creative Teaching in the Field of Spelling* (LaFollett Publishing Company, Des Moines, Iowa).

<sup>2</sup> Ellen C. Nystrom. *Self-Corrective Handwriting Charts, Grades III through VIII* (Farnham, Press, Minneapolis).

conversation, and programs for the similar sharing of dramatic and creative writing productions.

Most fundamental of all, perhaps, is the constant substitution of meaningful tasks for artificial exercises in order that pupils may be motivated to effort through appreciation of the intrinsic value of what they are attempting to learn.

#### VI. NEEDED RESEARCH IN THE DIAGNOSIS OF DIFFICULTIES IN ENGLISH

One cannot fail to be impressed, upon surveying the field of diagnosis of pupil difficulties in English, with the many problems awaiting research. A brief statement of a score of these will confirm the need for further investigation.

1. There is urgent need of agreement upon the objectives of the teaching of English. Once determined, they must be stated with unmistakable clarity and broken into specific elements capable of measurement or evaluation. What, for instance, are the skills involved in the "ability to marshal evidence or facts concerning a problem under consideration"? What is implied in the term, "adequate vocabulary," or "interesting style," so far as speaking and writing are concerned?

2. Studies of the relationship between such factors as health or social adjustment and success or failure in English are all but nonexistent.

3. Investigation is needed of the relationship between enriched classroom environment and the development of such powers of expression as adequate vocabulary and wealth of ideas. The sources of stimulation of creative writing are, for instance, practically unknown.

4. Experimental evidence is as yet lacking to prove the superiority of concrete, purposeful situations for teaching writing and speaking over artificial exercises and drills.

5. With one or two possible exceptions, there are no diagnostic tests in English today that actually diagnose pupil difficulties. Studies are needed of (a) variation in performance due to the nature of the test used, (b) adequate mapping of the whole area of difficulty, (c) frequency of appearance necessary to adequate testing of an element, and (d) approximation in the test of actual language situations in speaking and writing.

6. Process analysis akin to that in arithmetic must be developed in the field of English if pupil difficulties are to be obviated by preventive teaching. What factors, for instance, are involved in the

single process of learning to use the apostrophe to show possession or to indicate connection or relationship?

7. Instruments for analyzing power in composition are yet to be devised. What, for example, do we mean by 'forceful style,' by 'concrete diction,' by 'a wealth of ideas,' and how can they be measured? What are the components of 'ability to organize ideas,' and how can proficiency in it be tested?

8. Measures for oral composition approaching in objectivity those for written composition are necessary to the evaluation of methods of teaching in that field. Standards for articulation, rate of speaking, variety of tone, and other elements of oral technique are unknown to the average teacher.

9. Scales or other instruments are awaited for the evaluation of results in certain functional centers of expression, such as the making of announcements, conversations, and creative writing. Determination of pupil progress in the writing of verse is impossible without standards of judgment more objective than those available at the present time.

10. Studies in the relative learning difficulty of items in English are almost non-existent.

11. Records must be made in the near future of the amount of practice in the actual expression of ideas the average pupil has in the classroom.

12. Best methods of eliminating errors in the mechanics of English have been the subject of a few investigations. The importance of oral emphasis in drill and the value of grammatical analysis as an aid in the correction of errors are problems demanding immediate attention.

13. Best methods of improving pupil control of sentence structure are urgently in need of investigation, in view of the difficulty inherent in mastery of the sentence.

14. The Iowa technique for recording oral speech in the classroom reopens for investigation the whole field of pupil errors in English. It likewise makes possible a new and constructive attack upon old problems — a study, for instance, of the gradual development of pupil control over sentence structure — and provides limitless possibilities for the study of pupil powers of organization and the coherent development of ideas.

15. The problem of what is correct English usage has been little more than opened up by Leonard's studies in that field. Analysis of the actual writing and speaking of adults is still ahead. So also is the determination of the relative cruciality of errors.

16. Investigation of methods and content suited to the needs of

pupils of varying levels of ability is of major importance in English, as it is in other subjects of study.

17. Grade placement of materials on the basis of relative difficulty of items and pupil use and progress in mastery of them at various levels of instruction are matters for earnest inquiry at the moment.

18. Problems of remedial instruction needing investigation include such factors as the relative value of motivated versus unmotivated remedial teaching; the relative effectiveness of individualized versus group instruction; and the extent to which pupils may be taught to assume responsibility for the diagnosis and remediation of their own errors.

19. Objective recording of the study techniques of pupils who are successful and unsuccessful in various phases of English would do much to facilitate the program of remedial instruction.

20. Finally, checklists and other devices for the objective recording of pupil attitudes and appreciations as revealed in concrete classroom situations are fundamentally important to the evaluation of certain of the most vital outcomes of the teaching of English.



## CHAPTER XIV

### DIAGNOSIS IN ARITHMETIC

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Investigations of causes of pupil failure and retardation in the elementary school show that arithmetic is a subject that is extremely difficult for many children. Above the second grade inferior work in arithmetic has caused more non-promotions than any other subject in the curriculum.

In recent years systematic studies have been made to discover the factors that condition pupil growth in arithmetic. These investigations have dealt with such aspects of the total situation as the selection of the contents of the various units of instruction, the analysis and evaluation of teaching materials, the effectiveness of methods of teaching, the development of diagnostic tests to measure growth in the various phases of arithmetic, the genetic study of growth in arithmetic ability, and the diagnosis of arithmetic disabilities. While the findings related to all of these fields of research are piecemeal and incomplete, they contain much information which must be considered in attempting to improve instruction in arithmetic.

To diagnose arithmetic ability competently, the examiner must have a clear conception of the functions and objectives of arithmetic instruction, must be thoroughly acquainted with the scientific studies of the factors that contribute to success in arithmetic, must know the symptoms and causes of various unsatisfactory conditions, must be able to use effective techniques for bringing to the surface facts concerning the nature of the pupil's disability and his thought processes that would ordinarily be unanalyzed, and must be able to interpret the facts revealed by his study of the pupil and to suggest the steps to correct the condition. In this chapter some of these essentials of competent diagnosis in arithmetic will be discussed.

#### I. THE FUNCTIONS AND OBJECTIVES OF ARITHMETIC INSTRUCTION

In the modern school, arithmetical instruction has much broader objectives than those characteristic of the traditional school. In the

latter emphasis was placed on the mastery of the computational skills. Instruction was formal and routine. Little was done to socialize the subject and to teach the pupils the contributions number has made to the progress of the human race. Because of the difficult, meaningless nature of much of the work, large numbers of pupils failed. In many parts of this country a definite attack has been made on the problem of improving instruction in arithmetic by reducing the work of the lower grades, by shifting many of the computational skills to higher grade levels where they are more easily learned by the pupils, and by devising ways of enriching and vitalizing the subject.

For our purposes four major functions of arithmetic may be considered. The functions must be considered together with the general outcomes of all instruction, such as desirable social qualities, effective speech, the scientific attitude, and ability to work coöperatively with others. There follows a suggested classification of some of the knowledges, abilities, attitudes, and appreciations that may be grouped under each of the four functions of arithmetical instruction:

1. The computational functions, which involve the objective of developing
  - a. the ability to manipulate number processes with reasonable speed and accuracy
  - b. the ability to manipulate processes in the solution of verbal problems
  - c. the ability to check one's work
  - d. the ability to make estimates and approximations
2. The informational function, which includes
  - a. knowledge of essential historical aspects of the development of number and its applications
  - b. knowledge of the current status and practices of such social institutions as money, wages, banking, taxation, insurance, and the like
  - c. knowledge of ways in which number has facilitated measurement
  - d. knowledge of instruments of precision and how to use them
  - e. knowledge of the types of information essential to intelligent consumption, production, and distribution
3. The sociological function, which stresses social problems and issues, such as
  - a. the contribution of number to the development of social coöperation

- b the values and shortcomings of various social institutions, such as measurement, taxation, and banking
  - c. Methods of improving those institutions that are now being attempted or are possible
  - d. the sociology of number and its contribution to the progress of science
4. The psychological function, which includes
- a. understanding and appreciation of the structure of our number system
  - b. development of clear quantitative concepts and meaningful vocabulary
  - c. ability and disposition to use quantitative methods as the basis of precise, accurate, orderly thinking
  - d. ability to array simple statistical data in tabular or graphic form
  - e. ability to discover and express relationships between variables — the concept of functionality
  - f. ability to read and evaluate factual data presented in charts
  - g. appreciation of geometric design
  - h. disposition to apply quantitative techniques to the study of the issues and problems of one's everyday life
  - i. ability to estimate and express the extent to which error is likely to be present in a particular set of data
  - j. ability to use number as a basis of prediction

This analysis of outcomes emphasizes the belief that arithmetic should not be taught as a tool subject stressing the manipulation of number processes, but as a vehicle for making the pupil familiar with the many valuable contributions that number has made, and is making, to progress in the fields of business, industry, science, and human relations. In a sense arithmetic is here regarded as a social study. On this assumption the time allotted to arithmetic is to be devoted to various types of learning activities that will bring the learner into contact with a wealth of racial experiences dealing with the ways in which man has perfected the quantitative techniques and precise methods of analysis and control that enable him to deal in an orderly way with various aspects of his environment. The purpose of these experiences is to give the learner insight into the ways in which number functions in the solution of problems that arise in the affairs of life, and to increase his ability to apply quantitative techniques in the solution of his own problems. They make the work in arithmetic meaningful and vital.

A recognition of these four functions will lead to a reconstruction of the work our schools are offering in arithmetic.

It is evident that the four major functions of arithmetic are closely interrelated; for example, to think intelligently about the problems of taxation, the citizen must understand the various concepts involved; he must have information concerning the present methods of taxation, their values and limitations, and possible better forms of taxation; the ability to compute taxes may not be as essential an outcome of the study of taxation as the understanding of the present-day problems of taxation. Similarly, the objectives of the study of money should include not only a knowledge of the kinds of coins we have, and the ability to make computations involving money, but also an appreciation of the whole social institution of money and its place, past and present, in the affairs of man. Present-day problems related to money, and proposed solutions of these problems, must be given adequate consideration. Otherwise the rich contributions arithmetic can make to the understanding of the present social order will not be achieved.

From the point of view of diagnosis, it is essential that this four-fold concept of the objectives be borne in mind. The diagnostician of disabilities in arithmetic must not be satisfied with a study merely of difficulties in computation; he must recognize the fact that the pupil may be markedly superior, mediocre, or deficient in regard to any one or more of the other major functions of arithmetic. It may be granted that at the present time we know much more about diagnosis of computational difficulties than of disabilities related to the other functions; however, in view of their obvious importance, definite attempts should be made to improve our techniques for evaluating performances related to the other functions, and for determining the reasons for unsatisfactory achievement.

## II. INTERRELATIONS BETWEEN ARITHMETIC ABILITIES

The analysis of the functions of arithmetic just given shows that the desired outcomes of arithmetic instruction are numerous and varied. For diagnosis it is necessary to determine the extent to which these different outcomes are being achieved.

To find the relationship between the outcomes grouped under each of the four functions, Brueckner, Kellogg, and Van Wagenen<sup>1</sup> constructed scaled tests in computation, problem-solving, quantitative

<sup>1</sup> L. J. Brueckner, M. Kellogg, and M. J. Van Wagenen. *Analytical Scales of Attainment in Arithmetic, Grades 3 to 8* (Minneapolis; Educational Test Bureau).

vocabulary, and understanding of the types of quantitative relationships involved in the informational, sociological, and psychological functions of arithmetic. These tests were then given to a group of 453 pupils in typical 4A-5B classes in St. Paul. Table I contains a summary of the mean scores on the four tests and the range in the test scores.

TABLE I.—VARIABILITY IN ARITHMETIC ABILITY OF 453 PUPILS IN GRADES 4A-5B  
(Expressed in C— Scores)

	<i>Mean</i>	<i>Range</i>	<i>S.D.</i>
Computation	63.9	37.5 to 91.5	8.6
Problem-Solving	63.6	27 to 96	10.2
Vocabulary	64.5	24.5 to 103.5	10.8
Quantitative Relationships	65.6	23 to 92.5	9.4

It will be observed that the mean scores on the four tests are practically the same. However, the range of scores in each of the abilities is wide; expressed in terms of grade differences, the range between the highest and lowest scores is equivalent to more than five grades for each test. The variations in computation and problem-solving revealed by these results are similar to those found in other studies of these two phases of arithmetic. The results for the new tests in arithmetic vocabulary and understanding of quantitative relationships show that equally wide variations exist with respect to these important outcomes of instruction.

Correlations of these four tests with general intelligence and with each other were computed. Those between general intelligence and the various arithmetic test scores are all positive; they range from .350 with computation to .766 with vocabulary. The correlation between I.Q. and problem-solving, a more complex ability than computation, is .506; that between I.Q. and understanding of quantitative relationships, a trait more complex than problem-solving, is .602. The correlations with general intelligence tend to increase with the increase in the complexity of the traits involved. Low correlations between computational ability and vocabulary, .361, and between computational ability and understanding of quantitative relationships, .417, show that a pupil's rating on the computational test is not a reliable index of his ability as measured by the vocabulary or quantitative relationships test. Tests of each trait are essential for well-rounded appraisal.

The general conclusion may be drawn that for particular individuals

there are marked differences in the levels to which the various traits have been developed by learning, and that to make certain that growth of all of the desired traits takes place, direct provision must be made for educative experiences in which they may function.

To get a picture of the variability of the abilities of bright and dull children as measured by these four tests, the results for two groups of children, one consisting of 117 children with I.Q.'s of 100 to 129 and the other consisting of 116 children with I.Q.'s of less than 85, were compared. Judging from the overlapping of abilities revealed by the comparison, there is no reason to assume that the work in arithmetic for dull children need be limited to practice on computational processes; the evidence suggests that they can profit from participation in activities that deal with the social and cultural values of arithmetic.

Considerable research has been done to analyze the specific skills involved in the solution of examples in the various number processes. Detailed analyses of the various skills that constitute each of the processes in whole numbers, fractions, and decimals are available. The recognition of the necessity of making certain that the total area of a process is learned has led authors of instructional materials to see to it that adequate provision is made for the development of all of the skills.

These analyses of skills show the degree to which the several number processes are interrelated. For example, in long division, all four number processes are employed. Deficiency in any one of the processes may result in inferior performance in long division. In the same way the various processes in fractions involve many of the basic skills learned in work with integers. If pupils are deficient in these basic skills, the teacher may be sure that this weakness will seriously interfere with mastery of fractions.

### III. FACTORS THAT CONTRIBUTE TO GROWTH IN ARITHMETICAL ABILITY

#### 1. Physiological Factors

Practically all types of physiological deficiencies, such as defects of vision and hearing, that contribute to reading disability, contribute to disabilities in arithmetic. These deficiencies are fully discussed in the chapters on physical factors and on reading.

## 2. Mental Capacity

Many children lack the mental capacity necessary for efficient work in the arithmetic taught at their grade level. They may readily learn to count and to manipulate some of the easy steps in processes with whole numbers and simple fractions; however, they find it difficult to master more complex processes. It must be recognized that some pupils of relatively low mentality develop surprising skill in computation, while some pupils of more than average intelligence find distinct difficulty in mastering certain phases of arithmetic. Pupils of all levels of mentality from time to time encounter difficulties of a more or less temporary kind, some of which are easily eliminated, others of which may develop into serious disabilities because the particular skills may be essential in other work.

The relation between mental age and ability in arithmetic has been demonstrated effectively by the work of Washburne<sup>1</sup> and the Committee of Seven on the gradation of the various processes in arithmetic. This committee maintains that many of the processes are now taught at a grade level at which many pupils have not developed the mental ability necessary to master them.

Judd,<sup>2</sup> Brownell,<sup>3</sup> and others have demonstrated by experiment that the child's grasp of the number system grows slowly and also that children in the lower grades have widely different controls over the concept of precision. Number is not a mode of thought with which the child is innately endowed. Power to use number results from the continued application of number in a wide variety of situations in which the pupil can see number functions in the affairs of daily life. The degree of control in the pupil over basic number concepts may be inferred from the methods he uses in manipulating number facts. Inadequate methods of work tend to disappear with increasing maturity. It is apparent, however, that unless careful provision is made for the development of efficient control of number ideas in the lower grades, the pupil may be handicapped in his work in the upper grades; the richer and broader

<sup>1</sup> C. W. Washburne. "Mental age and the arithmetic curriculum." *Journal of Educational Research*, 23: 210-231.

<sup>2</sup> C. H. Judd. *Psychological Analysis of the Fundamentals of Arithmetic* (Supplementary Educational Monograph, No. 32. Chicago: University of Chicago Press).

<sup>3</sup> W. A. Brownell. *The Development of Children's Number Ideas in Primary Grades* (Supplementary Educational Monographs, No. 35. Chicago: University of Chicago Press).

the pupil's number experiences are in the lower grades, the more likely it is that his grasp of the number system and its functions will be efficient. To limit these experiences to the computational function alone, as is so often done in the primary grades, results in a much more meager background of meanings than will result if due consideration is given to developing concepts relating to the informational, sociological, and psychological functions of the subject.

Inaccuracy is a characteristic of all pupil performance in arithmetic. The inaccuracy may be due to any of numerous factors, such as inadequate number concepts, lapses in attention, indifference, incorrect copying, attempt to speed up work excessively, lack of control of basic skills in a total process, inability to carry through the steps in complicated computations in their proper sequences because of a short attention span, fatigue, confusion of processes, interferences of various kinds, emotional disturbances, and so on. In any case these factors all operate through a learning mechanism concerning whose functioning we know very little. Knight and Ford<sup>1</sup> say: "Much of the present thinking about error assumes that error is a much simpler phenomenon than it is. Errors may not be single in their nature. . . . Treating all errors alike is analogous to treating all fevers alike. . . . Much of our treatment of error, be it ever so heroic, is nevertheless superficial and unsuccessful because it is based on too little understanding of the psychological nature of the error and the processes leading up to it."

Considerable research has been undertaken for the purpose of analyzing the thought processes employed by pupils in working arithmetic examples. The teacher who is familiar with the peculiar, round-about, involved, inefficient methods of work employed by some pupils can readily realize the extent to which they may lead to inaccuracy. The classified list of faults in subtraction of whole numbers, adapted from the study by Buswell and John,<sup>2</sup> given in Table II illustrates the point involved. Many of these faults can only be the result of efforts by the pupil to devise his own methods of work; certainly he was taught few of them directly. Teachers have too generally assumed that pupils learn efficient procedures without careful guidance.

<sup>1</sup> F. B. Knight and E. Ford. "Temporary lapses in ability and errors in arithmetic." *Elementary School Journal*, 32: 111-124.

<sup>2</sup> G. T. Buswell in cooperation with Lenore John. *Diagnostic Studies in Arithmetic* (Supplementary Educational Monograph, Number 30. Chicago: University of Chicago Press).

TABLE II.— FREQUENCY OF OCCURRENCE OF THE MOST COMMON FAULTS IN  
SUBTRACTION OF WHOLE NUMBERS  
(Adapted from Buswell and John, page 137)

		Grades				Total
		III	IV	V	VI	
1.	Errors in Combinations . . . . .	62	75	69	40	246
2.	Borrowing:		*			
a.	Did not allow for having borrowed . . . . .	19	50	57	36	162
b.	Errors due to zero in minuend . . . . .	25	39	26	15	105
c.	Subtracted minuend from subtrahend . . . . .	47	33	12	4	96
d.	Failed to borrow; gave zero as answer . . . . .	21	20	14	4	59
e.	Deducted in minuend when no borrowing was necessary . . . . .	2	8	10	5	25
f.	Deducted two from minuend after borrowing . . . . .	1	5	8	6	20
g.	Increased minuend digit after borrowing . . . . .	2	2	6	2	12
h.	Deducted all borrowed numbers from left hand digit . . . . .	1	0	1	0	2
3.	Counting . . . . .	43	44	39	10	136
4.	Faulty Procedures:					
a.	Said example backward . . . . .	21	38	29	12	100
b.	Added instead of subtracted . . . . .	18	9	19	1	47
c.	Used same digit in two columns . . . . .	18	15	3	4	40
d.	Omitted a column . . . . .	9	13	8	5	35
e.	Split numbers . . . . .	7	5	10	2	24
f.	Ignored a digit . . . . .	12	6	2	3	23
g.	Used minuend or subtrahend as remainder . . . . .	10	6	2	0	18
h.	Began at left column . . . . .	2	0	1	0	3
5.	Lapses, etc.:					
a.	Derived unknown from known . . . . .	12	9	13	3	37
b.	Error in reading . . . . .	14	5	13	10	42
c.	Error due to numbers in minuend and subtrahend being the same . . . . .	1	5	10	3	19
d.	Reversed digits in remainder . . . . .	4	7	2	4	17
e.	Confused process with division or multiplication . . . . .	5	6	3	2	16
f.	Skipped one or more decades . . . . .	3	4	7	0	14
g.	Based subtraction on multiplication combination . . . . .	1	2	3	0	6
h.	Error in writing answers . . . . .	2	1	0	1	4
	Total cases . . . . .	84	109	109	70	372

Either through accident, trial and error, or careful teaching, some pupils learn advantageous methods of work similar to those used by individuals with mature skill in arithmetic; these methods contrast

sharply with the inefficient, unsystematic procedures that many pupils devise who are not carefully guided in the learning of efficient methods of work. The teacher should seek through specific teaching to develop economical, efficient methods of performing operations.

Relatively little is known concerning the cruciality of the errors that pupils make or the faulty procedures they use. Some of these errors and faulty procedures are of minor significance, whereas others undoubtedly are symptoms of serious difficulty. Frequency of occurrence alone is not a valid index of cruciality. Some kinds of errors, such as incorrect sums of combinations, are found in the work of both superior and inferior workers. Surprisingly little is known concerning the types of faults that differentiate the work of pupils of different levels of ability. What we need most in arithmetic is a list of the faults that are valid indices of the operation of factors that reduce efficiency of work in arithmetic, symptoms by which they can be recognized, and standard tests by which their seriousness can be determined.

### 3. Pedagogical Factors

Factors inherent in the methods of instruction obviously contribute to the development of learning difficulty, although little is known as to what extent they do so. The teacher may have a very narrow view of the functions of arithmetic instruction and emphasize the computational function to the neglect of the other important objectives; the teacher may lack the technical information required by the arithmetic curriculum that emphasizes an enriched conception of the subject; the teacher may be unskilled in developing number concepts; the teacher may stress speed too much; the teacher may fail to adapt instruction to the varying needs of pupils; when pupils show a low performance on a test, the teacher may assign further practice without attempting to determine the nature of the difficulty that caused the poor work, and thus fix bad habits of work; the teacher may fail to recognize the need of an adequate program for maintaining the skills in arithmetic, which then rapidly deteriorate; the teacher may fail to use legitimate types of motivation of drill work, such as progress charts, rewards, and similar incentives, which experiments have demonstrated contribute significantly to growth in arithmetic; the teacher may fail to teach the pupils efficient, economical methods of work; the practice provided may be poorly distributed and insufficient in amount.

Some teachers assign practice on a new step in a process before they have determined whether or not the learner understands the step and

knows the procedures to use. This difficulty can be alleviated by the use of models, study helps, and in doubtful cases by having the pupil give the new steps orally as he works an example. When the pupil does not understand the step, his practice is hit or miss and may result in uneconomical and even incorrect procedures, sometimes difficult to correct.

An illustration was recently observed in a third-grade class in which the teacher used the example 82—37 in introducing the new step of carrying in subtraction. The teacher carefully taught the pupils to say: 7 from 12 is 5. One little girl, however, also saw that 2 from 7 gave 5. She forthwith adopted the idea that in all cases one subtracts the smaller from the larger number, regardless of whether the larger number is in the minuend or in the subtrahend. In the practice exercises assigned immediately after the presentation of the step by the teacher, the child worked each example on this basis. Without determining the cause of her difficulty, the teacher simply assigned more practice on the new step. This child used this incorrect procedure for a whole month before a special examiner located the nature of the difficulty.

The quality of the materials of instruction has a marked influence on the success with which pupils master arithmetic. Some instructional materials are apparently constructed on the assumption that there is a high degree of transfer among the various skills of which a process is composed and among the several processes. Brueckner, for example, found that one fifth-grade arithmetic textbook contained practice materials on only twelve of fifty-eight different types of examples in subtraction of fractions. Evidently a high degree of transfer was assumed. Beito,<sup>1</sup> Olander,<sup>2</sup> and others have shown that there is a high degree of transfer among simple addition combinations. Overman,<sup>3</sup> on the other hand, shows that, while transfer exists in useful amounts among the various types of examples in addition and subtraction of whole numbers, the extent of transfer among pupils of average and lower mentality is so uncertain that all steps in computations in these processes must be taught. If all steps are not taught,

<sup>1</sup> E. A. Beito and L. J. Brueckner. "Measurement of transfer in the learning of number combinations." In the *Twenty-Ninth Yearbook* of this Society, Part II, 569-587.

<sup>2</sup> H. Olander. "Transfer of learning simple addition and subtraction." *Elementary School Journal*, 31: 358-369, and 427-437.

<sup>3</sup> J. Overman. "An experimental study of transfer of training." *Elementary School Journal*, 31: 183-190.

it is likely that pupils, especially the slower ones, will not make the generalizations required and hence may encounter serious difficulty with a type of example that presents a new combination of skills. While there is no direct experimental evidence concerning the degree of transfer in other number processes, it seems reasonable to assume that all of them should be taught to the pupils in such a way that they encounter only one new difficulty at a time. A recent study by Harap<sup>1</sup> indicates that pupils readily acquire a high degree of mastery of processes in fractions when the various steps are presented as the need for them arises in typical activity units; that is, in a random, rather than in a logical, order.

The instructional material may contain subject matter that is too difficult for the pupils. The use of long examples in column addition in the lower grades, requiring a much larger span of attention than primary-grade pupils possess, results in a high degree of inaccuracy. Young children are often nonplussed by problems containing large numbers. Experiment shows that some textbooks contain verbal problems so difficult that typical pupils at the end of the year can solve less than forty percent of them correctly. The instructional material may be constructed without definite specifications as to structure and content and without due consideration of the difficulties presented to pupils. If the material is set up in an unattractive, uninteresting manner, with little appeal to children, unnecessary difficulties may arise because of lack of interest.

Numerous problems arise owing to the shifting nature of the school population. The requirements for given grades vary from one system to the other. Failure to meet these variations in the case of transfer students leads to serious gaps in their training. Similar difficulties arise from lengthy absence from school. Methods of work in arithmetic, e.g., in subtraction, also differ in different schools and cause needless confusion. There is here an obvious argument for arriving at uniformity in grade placement and techniques.

#### 4. Social and Environmental Factors

Social and environmental factors play an important part in growth in arithmetic ability, when conceived from the point of view of the four major functions of the subject. The child whose parents try to teach him some of the essentials of thrift, business practices, taxation,

<sup>1</sup> H. L. Harap and C. Mapes. "The learning of fundamentals in an arithmetic activity curriculum." *Elementary School Journal*, 34: 515-526.

or insurance has a big advantage in the discussion of such topics over the child who is not given such training. The child from the home equipped with an ample supply of reference books and other types of source material can readily find information concerning social issues that many children have no way of getting because they have no access to such materials. This lack the school library can to some extent overcome. Judging from the results of tests of children's beliefs and concepts dealing with simple economic questions such as profit, wages, taxation, and the like, it is clear that many of them have learned wholly erroneous notions from their daily contacts with their social group. It is obvious that the teacher must adjust the work of the class to the experiential background of the children. Where the background is meager, the teacher must promote learning experiences that will enrich it.

### 5. Emotional Factors

A purposeful, interested attack by the pupil is essential to progress in arithmetic. Lack of interest leads to a reduction in effort put forth. The pupil who fails to make progress in his work often develops a bad attitude toward arithmetic; the habit of failure becomes established, and ordinary instruction brings about little improvement. In such cases the teacher must take steps to change the pupil's attitude by making necessary instructional and personal adjustments.

## IV. SYMPTOMS OF FAULTY LEARNING IN ARITHMETIC

There are various symptoms, some of which are given herewith, by which the teacher can recognize the existence of some sort of inadequacy in arithmetic.

*a. Low scores on survey tests.* A score on a survey test more than a year below the standard of the grade is a valid symptom of faulty learning, especially if the pupil's scores on tests in other subjects are average or above.

*b. Low scores on analytical tests* Scores that are below standard on tests of processes or elements of a single process indicate the need of more precise diagnosis of the nature of the difficulty.

*c. Inability to work three or four examples of a type correctly.* Failure to work one example of a given type incorrectly is not a reliable index of disability. When three or more examples of a single type are worked incorrectly, a persistent fault is likely to be present.

*d. Inaccuracy of work.* Inaccuracy of work is readily determined

by finding the proportion of work that is incorrect. The cause of the incorrect answers should be determined.

*c. Slow rate of work.* Slow performance is readily revealed by locating pupils who score low on rate tests. Slow rate of work suggests the presence of faulty methods of work.

*f. Faulty methods of work.* Counting, roundabout methods of work, dawdling over assignments, repetition of work, etc., reveal inadequate control of the process involved.

*g. Faulty arrangement of work.* This symptom usually indicates lack of understanding of the process involved.

*h. Guessing.* The pupil gives incorrect answers and solutions at random, suggesting serious deficiencies in knowledge and skill.

*i. Failure to improve with practice.* This symptom is readily apparent when standardized practice materials are used which enable the teacher to compare the scores by the pupil in practice on the same exercise from day to day. Failure to progress and erratic variations in scores from day to day are significant symptoms.

*j. Excessive and unnecessary motor activity.* When pupils encounter a special difficulty in working an example, a general bodily reaction often results, as in excessive head and body movement.

*k. Repetition of the work on an example in which the work was partially completed.* In adding a long column of figures, pupils often begin the work again before completing the entire column because of faulty control of attention.

*l. Confusion of processes.* In working examples, the pupil confuses several processes, using elements from each of them, a condition commonly designated as 'interference.'

*m. Lack of interest.* This attitude is revealed by such symptoms as failure to complete assignments, indifference to suggested activities, and failure to volunteer original contributions.

*n. Failure to answer correctly questions dealing with the interpretation of tabular and graphic materials.* Pretests of ability to interpret graphs and tables help to locate the points on which help is needed.

*o. Inability to array quantitative data in graphic or tabular form.* The pupil does not know how to proceed when face to face with a body of data that he must arrange in an orderly way.

*p. Inability of the pupil to restate a problem in his own words.* This suggests failure to grasp the essential elements of the problem.

*q. Faulty concepts and beliefs.* The pupil has incorrect concepts,

for example, of the square foot, or erroneous ideas concerning simple economic concepts, such as profit.

*r. Inability to apply what has been learned in practical situations.* The pupil may give the formula for area of a circle, but be unable to make the measurements necessary to find the area of a given circular surface, such as a flower bed.

*s. Inadequacy of vocabulary.* The pupil cannot express essential ideas because he lacks the necessary vocabulary.

#### V. DIAGNOSING GENERAL ABILITY IN ARITHMETIC

The most direct method of evaluating arithmetic ability is by tests dealing with the four functions of arithmetic. Such tests may have as their purpose the measurements of general traits, such as computational ability, knowledge of vocabulary, ability to apply quantitative techniques in the solution of problems, and the like. Most of the present-day tests in arithmetic measure ability in computation and in solving verbal problems. Few tests are available dealing with the informational, sociological, and psychological functions of arithmetic. The ability of the individual to apply quantitative techniques in the solution of the problems of daily life may be evaluated by observation. It is difficult to arrange a standardized test for this.

General survey tests enable the teacher to determine the general phases of instruction that have been adequately stressed and those that must be more fully developed; such tests also enable the teacher to select those pupils whose performances are below standard, so that their work can be observed and analyzed to determine the nature of their deficiencies. It is important that this survey consider all of the major functions of arithmetic.

#### VI. DIAGNOSING SPECIFIC ABILITIES IN ARITHMETIC

##### 1. Diagnosing Number Processes

When general survey tests reveal an unsatisfactory condition in regard to some major element of arithmetic ability, tests of a more analytical type should be used to locate more definitely the precise element that may be at the root of the difficulty. Adequate tests of this kind are available for locating weaknesses in computational ability; for example, the Compass Diagnostic Test in Addition<sup>1</sup> breaks up the general ability to add whole numbers into constituent elements and provides tests of each element.

<sup>1</sup> Published by Scott, Foresman and Company, Chicago.

Another type of analytical test contains a standard sampling of the various combinations in which the skills that constitute a major ability, such as addition of fractions, can occur. The Brueckner<sup>1</sup> diagnostic tests in whole numbers, fractions, decimals, and percents are of this type. Analytical tests of this kind are especially necessary to aid in locating very specific shortcomings when the processes are being learned; they do not give exact measures of the level of the pupils' ability. For class diagnosis, tests containing single examples of each type may be used. Tabulations showing the number of times each example was solved incorrectly will then locate the points on which reteaching is necessary for most members of the class.

## 2. Diagnosing Problem-Solving

An analysis of the processes involved in solving typical problems suggests that the teacher should use the following types of analytical tests to locate possible sources of weakness in general problem-solving ability:

1. Analytical tests of arithmetic processes to discover the degree to which inaccuracy and inability to perform the computations required in the solution of the problems are the sources of the deficiency.
2. Tests of basic information, such as formulas, knowledge of tables of measure, and so on, required for the solution of problems. There are no standard tests available. However, most textbooks contain informal tests of this kind. The teacher can also easily prepare others.
3. Tests of arithmetic vocabulary, including expressions dealing with the various kinds of quantitative relations involved, to discover the extent to which lack of vocabulary is a factor. The Pressey and the Brueckner vocabulary tests are of this type.
4. Tests of careful silent reading, such as the Gates Silent Reading Test, and the Sangren-Woody Reading Tests, to discover the extent to which weakness in reading may contribute to inability to solve problems.
5. Tests on the analysis of verbal problems, including exercises stating the process to be used in solving the problem, what is to be found, and the facts given in the problem. The Compass Diagnostic Tests and the Stevenson Problem Analysis Tests are helpful.
6. Tests on the ability to estimate answers of problems. There are

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<sup>1</sup> Published by John C. Winston Company, Philadelphia.

no standard tests. However, most arithmetic textbooks and work books provide simple tests of the ability to estimate answers.

7. Tests for determining the extent of the experiential background of the pupil essential to the understanding of the topics being considered. The Brueckner Test on Understanding of Quantitative Relationships affords a measure of the general experiential background of the pupil.

While such a series of analytical tests will yield valuable information concerning the general status of problem-solving ability, they are of relatively little value in analyzing the basis of difficulty in solving a particular group of problems. For this purpose the teacher can prepare informal exercises to test these various elements as they appear in the particular group of problems. For example, the teacher may test the ability of the pupils to perform the operations required in the solution of the problems, their understanding of the vocabulary included in the problems, and so on for each of the elements.

### 3. Diagnosing Informational, Sociological, and Psychological Outcomes

An examination of the specific outcomes listed earlier in this chapter under the informational, sociological, and psychological functions will reveal to the reader the many detailed aspects of arithmetic that must be considered in diagnosis. The essential steps in diagnosing them are the same as those that are used in diagnosing processes and problem-solving. The ability to be evaluated must be clearly defined. The situations in which this ability may express itself must be determined. There must be a suitable record of performance. Standards must be available to aid in the interpretation of the record. Unfortunately, there are available practically no standard tests which will enable the teacher to determine the extent to which any one of these specific objectives is being achieved. Informal techniques would have to be used to evaluate pupil reactions.

## VII. DIFFICULTIES IN INTERPRETING THE RESULTS OF ANALYTICAL TESTS

### 1. Inadequacy of Present Norms

To aid in the interpretation of scores on analytical tests norms of performance established in various ways are used. On some tests, for example, the Compass Diagnostic Tests, norms are based on the number

of items worked correctly in a specified period of time, regardless of the number of items that are attempted. For other tests, such as the Courtis Series-B, norms for both the number of examples tried and the number correct in a specified length of time are given. For yet others, such as the Bruerkner Tests, no norms are provided, because their purpose is merely to locate the kinds of examples the pupil does not know how to work.

It is naive to assume that the performance on one trial of these tests is a valid index of the pupil's ability. Courtis<sup>1</sup> has shown to what extent various conditions, like stressing accuracy or speed, praising, rewarding, etc., may affect the pupil's performance. He reached the conclusion that "scores on single trials of educational tests cannot be reliably interpreted without some knowledge of the effort level of response."

Speed of work, however, is an important factor in the evaluation of ability, since slow work on a rate test is a symptom of faulty methods of work. The pupil who uses roundabout inefficient methods of work will make a lower score on a test than a pupil whose methods are direct and well controlled. The point to be kept in mind is that speed of work alone is not a complete criterion of ability, since accuracy must also be considered.

Consider the following scores on a speed test of 40 items, the standard scores being 30 tried and 27 correct.

Pupil	Attempted	Correct	
A	40	40	Superior speed and accuracy
B	40	27	Superior speed and at standard in number of items correct
C	30	27	Standard speed and accuracy
D	30	15	Standard speed and low accuracy
E	15	15	Below standard in number of items attempted and correct

Here Pupil A is superior in both rate and accuracy, an index of a high degree of skill; Pupil E is below standard in both the number attempted and the number correct, an apparent index of inferior ability, when evaluated by the norms, in spite of the fact that this pupil worked all examples attempted correctly. Pupils B and C both have scores for number correct that are equal to the standard scores. On this basis

<sup>1</sup> S. A. Courtis. *Why Children Succeed* (Detroit: Friesema Press).

their performance was satisfactory. However, Pupil B attempted 10 more items than Pupil C. On the basis of the number attempted, Pupil A is above standard in ability. However, when both rate and accuracy scores are considered together, it is evident that Pupil B is a relatively inaccurate worker. Pupils C and D both have scores for number attempted that are equal to the standard, but Pupil D is considerably below standard in the number of items correct. Pupil E is much below standard in number correct, but he is an accurate worker. These cases show the limitations of norms based on the number of items attempted or the number of items correct.

Another point should be mentioned. Unless analytical tests are carefully constructed, the scores on timed tests may be greatly affected by variations in the difficulty of the items included, since a pupil may spend excessive time on some difficult item, and hence make a low score in number attempted. This suggests the need of extreme care in the construction of analytical tests to locate specific weaknesses in arithmetic. The narrower the element measured by the test, the more easily the range in the difficulty of items in the test can be controlled. This limitation of analytical tests that emphasize rate of work has led to the development of types of diagnostic tests that merely determine whether or not a pupil can work examples of various types correctly, regardless of his speed. There is no need for emphasizing speed when new processes are being learned. If the pupil knows how to work an example, his speed of working similar examples can be increased by well-directed practice.

Another point: the basis of the norms on tests in problem-solving is open to question. These scores are usually expressed in 'number of answers correct.' It is known that from 20 to 40 percent of incorrect solutions are due to errors in computation. Hence a score on a problem test may be low, not because of the pupil's inability to 'reason out' the method of solving the problem, but because of his inability to compute accurately. Monroe has developed a plan of scoring problem-solving tests for both correctness of method and accuracy in computation. His technique has not proved wholly satisfactory because of the difficulty of establishing an objective basis for rating method; the pupil may get the correct answer by complicated, roundabout methods, difficult of analysis. In other cases many of the steps involved in the solution are taken mentally and there is no objective record available to give any sort of clue as to the thought processes that were used.

Although the method of analytical diagnosis reveals the processes

in which a pupil is deficient or locates the specific phases of a skill that may be the source of difficulty, these results yield at best only a partial diagnosis, since the teacher must also determine the nature of the difficulty by using more penetrating techniques than such tests provide. The pupil's score may show that he is much below standard in ability in some process, but it does not reveal the causes of this condition. The assignment of practice exercises to strengthen weak spots without a careful study of the nature of the difficulty may then be worse than useless, since faulty habits that exist may be strengthened, instead of being corrected.

## 2. Contributions of Laboratory Studies to the Analysis of the Learning Process in Arithmetic

The laboratory method has made available much precise information concerning the nature of the mental processes employed by children in their work in arithmetic. By means of special apparatus, Buswell and John studied the eye movements of children in working examples in various processes with whole numbers. They found that workers of superior ability add numbers in a column in rapid succession, while pupils of inferior ability use various roundabout methods. Buswell suggests that many of these faults may disappear as the pupil develops power through practice in the later grades, while others can undoubtedly be corrected by teaching the pupil more efficient procedures.

Buswell also made a time analysis of the performances of pupils in the various steps of working arithmetic examples, to determine how their time was distributed among the steps involved. He also compared the performances of mature individuals and of children. His results showed wide variations but considerably greater regularity among the superior than among the inferior workers. "Adults who are even fairly expert in dealing with the fundamental processes carry on the various operations in an example with a considerable degree of regularity." These results raise the question as to the extent to which the maturity of the pupil may be a factor in the development of efficient methods of work in arithmetic, since inefficient procedures tend to disappear as pupils acquire increased mastery through practice. On the other hand it is probable that many of these faults have developed because of inefficient teaching procedures and faulty materials of instruction. The fact that many pupils have efficient, economical methods of work, similar to those used by adults, suggests the possibility that many of the faults revealed by the laboratory investigations could be averted.

if a definite attempt were made to teach all pupils more effective procedures.

### 3. Variability of Faulty Reactions

Care must be taken in the making of a diagnosis on the basis of information secured either through observation, analysis of written or oral work, or the laboratory technique, because many errors are due to slips, lapses, and temporary inadvertencies, rather than to a persistent fault.

Brueckner and Elwell<sup>1</sup> studied faulty procedure in multiplication of fractions. They sought to determine the extent to which incorrect solutions of examples involving identically the same skills are due to the same kinds of error or faulty procedure. This problem has important bearing on the reliability of diagnosis since undoubtedly many errors are chance accidental slips rather than definite indications of basic difficulties. This is likely to be the case when the pupil misses only one of a group of four similar examples.

In this study Brueckner and Elwell had 327 sixth-grade pupils work four examples of each of six different types in multiplication of fractions — 24 examples in all, arranged in a random order. In 1101 instances the pupils solved from one to four of the four examples of a particular type incorrectly. In 40.2 percent of the cases only one of the four examples was solved incorrectly; in 23.7 percent two of the four examples were solved incorrectly; in 14.4 percent three were solved incorrectly; in 21.6 percent all four were solved incorrectly. These data show that failure to work a single example of a given type correctly is not at all a reliable index of what a pupil is likely to do on another example of that type, since in 59.8 percent of the cases pupils who solved one example of a given type incorrectly made errors in from one to three of the remaining three examples, while in 40.2 percent of the cases the other three examples were solved correctly.

The question may be raised, if one analyzes the work of the pupil to determine the nature of the errors made on a number of examples involving identical skills, to what extent the particular types of errors persist from one example to the next one. In their study Brueckner and Elwell located 3458 specific errors, which were classified into ten major groups. Each of these major groups was divided into sub-types; in all there were 52 different sub-types, each one representing a peculiar

<sup>1</sup> L. J. Brueckner and M. Elwell. "Reliability of diagnosis in the multiplication of fractions." *Jour. of Educ. Research*, 26: 1933, 175-185.

variation of procedure. In the work of particular pupils these types of errors appeared in many combinations and variations. There was no particular combination of errors that appeared to be symptomatic of general disability, like the combinations of symptoms that appear in various illnesses or diseases. The data were analyzed to determine the extent to which specific types of errors or faulty procedures persisted when there were two or more incorrect solutions of the four examples of each type. The results of this analysis of variations in errors are given in Table III.

TABLE III.—VARIATIONS IN ERRORS FOUND IN MULTIPLYING FRACTIONS

<i>Types of Errors</i>	<i>Number</i>	<i>Percent</i>	<i>Total Percent</i>
A. Single Example Missed			
1. Single error . . . . .	374	84.4	84.4
2. Combination of two errors . . . . .	49	11.1	11.1
3. Combination of three errors . . . . .	19	4.3	4.3
4. Combination of four errors . . . . .	1	.2	.2
B. Two Examples Missed			
1. Identical error (single or combination) . . . . .	63	24.1	24.1
2. Constant with variation . . . . .	18	6.9	6.9
3. All varied . . . . .	—	—	69.0
(a) Single . . . . .	133	51.0	—
(b) Combination . . . . .	47	18.0	—
C. Three Examples Missed			
1. Identical error (single or combination) . . . . .	20	12.6	12.6
2. Constant with variation . . . . .	19	11.8	11.8
3. Pairs with variations . . . . .	—	—	46.7
(a) One pair . . . . .	65	40.9	—
(b) Two pairs . . . . .	8	5.0	—
(c) Three pairs . . . . .	1	.8	—
4. All varied errors . . . . .	—	—	28.9
(a) Single . . . . .	19	11.9	—
(b) Combination . . . . .	27	17.0	—
D. Four Examples Missed			
1. Identical error . . . . .	38	16.0	16.0
2. Constants (with variations) . . . . .	66	27.8	27.8
3. Triplets (with or without variations) . . . . .	63	26.5	26.5
4. Pairs (with or without variations) . . . . .	54	22.7	22.7
5. All varied . . . . .	—	—	7.0
(a) Single . . . . .	6	2.5	—
(b) Combinations . . . . .	11	4.5	—

This investigation shows conclusively that errors in arithmetic processes made by superior as well as inferior workers are highly vari-

able and that the mental processes involved in arithmetic cannot be readily explained on a simple mechanical basis. If errors persisted steadily, or appeared in definite systems or patterns, the nature of the mental reactions of the learner might be quite readily analyzed. As it is, owing to the complicated nature of the learning process, we must admit the relative inadequacy of our present techniques of analysis and diagnosis. It is obvious that diagnosis based on single examples is inadequate.

### VIII. TECHNIQUES FOR ANALYZING THE NATURE OF ERRORS AND FAULTY METHODS OF WORK IN PROCESSES

Survey and analytical tests help the teacher to locate the source of difficulty. Test results do not give adequate data concerning the pupils' methods of work, nor do they reveal the nature of errors made.

There are four general methods that can be used to analyze errors and faulty methods of work: (1) observation of the pupil at work, (2) analysis of written work, (3) analysis of oral responses, and (4) interviews.

#### 1. Observation of Pupil Reactions

Through observation of the pupil at work, the teacher can learn much concerning his methods. Faulty procedures, such as counting, dawdling over assigned work, roundabout methods, day-dreaming, inattention, and the like, can thus be readily discovered. This observation may be made more searching if guided by a check list of the overt types of symptoms that indicate various types of arithmetic disabilities.

#### 2. Analysis of Written Work

Through an analysis of the pupil's written work, the nature of many errors and faulty methods of work can be determined. For example, in the subtraction example  $81 - 37 = 42$ , the pupil obviously did not know the correct answer to the combination  $11 - 7$ . This is shown by the partial answer, 2. In the example  $962 - 783 = 189$  the nature of the error is not so obvious. Did the pupil forget that he had borrowed from the 6, or was his error due to giving the incorrect remainder in subtracting 8 from 15? An analysis of the written work does not reveal the mental processes of the pupil at each step of the solution. They may have been very involved and uneconomical, but this is not evident from what is written on the paper. In the example  $6\frac{1}{8} - 1\frac{5}{8} = 3\frac{5}{8}$  it is not possible by analyzing the work that is given

to determine what the nature of the difficulty is. In an extensive analysis of approximately 2,500 errors in addition of fractions, Chestek<sup>1</sup> was able to determine the nature of only two-thirds of the errors by examining the written work.

The chief weakness of the technique of diagnosis through analysis of written work is its invalidity. The more complicated the process, the more difficult the diagnosis. In many doubtful cases, the examiner is forced to make inferences as to the nature of the difficulty that may be wholly incorrect, as illustrated in the second example just given. However, as a first step in diagnosis, analysis of the written work should be used.

### 3. Analysis of Oral Responses

A technique of diagnosis has been developed by Courtis and since employed in many of the investigations of difficulties in arithmetic processes; namely, the analysis of the statements of the pupil as he works examples aloud. A teacher who has never had a pupil of low ability thus report his steps in the solution of an example can hardly be aware of the many strange tricks and peculiar methods of thinking of such pupils. The study of the processes of deficient pupils by Buswell and John revealed the following faulty procedures in carrying in column addition of pupils in Grades III to VI:

- (1) Added carried number last
- (2) Forgot to add the carried number
- (3) Added carried number irregularly (sometimes first, sometimes last, sometimes in the middle of the example, etc.)
- (4) Wrote the number to be carried
- (5) Carried the wrong number (sum 28, wrote 2 carried 8)
- (6) Carried when nothing to carry
- (7) Wrote carried number in the answer
- (8) Added the carried number twice
- (9) Subtracted the carried number

Such strange faults cannot be detected by test scores, casual observation, or analysis of written work. They must be searched out by techniques that are more clinical in nature. We point out the great value of this technique or diagnosis, and we suggest that every teacher should have the training required to make it a part of her technical teaching equipment. It is known that many pupils whose test scores

<sup>1</sup> Reported in L. J. Brueckner. *Diagnostic and Remedial Teaching in Arithmetic* (Philadelphia: Winston, 1930).

are up to standard are nevertheless working below their optimal levels because of the ineffective methods they employ.

Standardized diagnostic tests and record blanks containing the most common faults of pupils in each of the four fundamental processes in whole numbers, fractions, and decimals are available.<sup>1</sup> Their use will greatly facilitate the diagnosis.

#### 4. The Interview

When the examiner needs more exact information as to the pupil's methods of work, the interview technique may be employed. This approach is especially necessary when it is evident to the examiner that the pupil who is giving orally steps in the solution of an example is unable to describe his method clearly or when there are faults in his written work that the examiner cannot readily analyze. If the examiner secures the coöperation of the learner, systematic questioning will often reveal conditions that would otherwise be undetected. Often the pupil can be brought to indicate the points that are the root of his difficulty. Also, through the interview the examiner can teach the pupil techniques of self-diagnosis, an important element in the purposeful participation by the pupil in the remedial program. The interview with the pupil may be supplemented by interviews with other individuals — for instance, parents — who may be able to give helpful information.

### IX. DIAGNOSIS OF DIFFICULTY IN PROBLEM-SOLVING

The one factor that is most operative in reducing scores in tests of problem-solving is inaccuracy in computation, which accounts for from twenty to forty percent of the incorrect answers. Lutes<sup>2</sup> has shown that, if pupils are given practice beforehand on the computations involved in a problem test, there is a marked increase in the pupils' score on the test. If our purpose is to measure the power of the pupil to 'think through' the steps in 'reasoning out' a solution, it seems reasonable to suppose that we should reduce the difficulty of the computations in problems to a minimum.

<sup>1</sup> For example, Buswell-John, *Diagnostic Tests in Fundamental Processes* (Public School Publishing Company), and Brueckner, *Diagnostic Tests in Whole Numbers, Fractions, and Decimals* (Educational Test Bureau, Minneapolis).

<sup>2</sup> O. W. Lutes *An Evaluation of Three Techniques for Improving Ability to Solve Arithmetic Problems* (University of Iowa Monograph in Education, No. 6, Iowa City, Iowa: University Press).

In addition to inaccuracy of computation, the chief factors contributing difficulty in solving conventional verbal problems are (1) failure to comprehend the problem in whole or in part, owing to inferior reading ability, difficulty of the situation presented, inability to visualize the novel elements in the situation, and similar conditions; (2) carelessness in reading, resulting in misreading, or the omission of essential ideas; (3) confusion of thinking, resulting in the random trial of any process that may occur to the pupil; (4) lack of knowledge of essential facts, such as how many inches there are in a yard, of formulas, such as how to find the perimeter of a rectangle, and the like; (5) inability to perform the computations involved; (6) carelessness in arranging written work and general lack of neatness; (7) lack of interest resulting from failure of the pupil to grow in ability to solve problems, the unattractiveness of the instructional materials, their difficulty, and the like; (8) failure to grasp the quantitative relations involved in the problem, owing to lack of vocabulary or lack of understanding of basic principles, such as the relation between selling price, cost, profit, and margin; and (9) lack of an efficient method of attack in solving problems.

These faults can be located by diagnostic methods similar to those used to determine the weaknesses in fundamental processes. The teacher should observe the behavior of pupils of inferior ability, especially during the reading period and when solving problems. An analysis of their written work in problem-solving will often reveal the nature of their difficulty. These techniques should be supplemented by personal interviews, during which a clinical procedure should be followed so that the pupils' methods of work in solving problems can be analyzed in detail. All available data, such as health records, social records, reading-test records, intelligence-test scores, and the like, that will help to make a diagnosis of the difficulty should be considered.

#### X. DIAGNOSING THE NATURE OF FAULTS IN REACTIONS ASSOCIATED WITH OTHER ASPECTS OF THE INFORMATIONAL, SOCIOLOGICAL, AND PSYCHOLOGICAL FUNCTIONS

To analyze the nature of faulty reactions related to other aspects of the informational, sociological, and psychological functions, the teacher can use techniques similar to those described for analyzing faults in processes and problem-solving. Through observation of the pupil's reactions in a social situation the teacher can locate deficiencies and inefficient methods of work. For example, in measuring a given

area the pupil may not attack the task systematically; he may apply measuring devices in a faulty way or inefficiently; he may not make the essential measurements. Similarly, the teacher can see whether the pupil uses efficient methods in looking up reference materials. An analysis of his oral contributions may reveal lack of comprehension, confusion in thinking, and lack of essential ideas. His general behavior as evidenced by inattention and failure to contribute to the class discussion may indicate lack of interest.

Through an analysis of the pupil's written work the teacher can locate faulty concepts, erroneous ideas, and other evidences of mislearning. This procedure can be facilitated by using informal tests so constructed that they will bring out these faults. A follow-up interview will help to locate the sources of these incorrect notions. An analysis of written reports may reveal failure to organize ideas efficiently, and other faults in writing described in detail in the section on English.

By judicious questioning in many respects similar to the interview technique the teacher may discover reading difficulties that interfere with the efficient study of topics and social problems taken up in the arithmetic class. Some difficulties arise because of lack of ability to use subject tools, such as tables, graphs, charts, pictures, indices, and the dictionary. Other reading difficulties that must often be analyzed on an individual basis through systematic questioning are inability to recognize relations in what is read, lack of knowledge of essential related information, deficiencies in vocabulary, inaccuracies in reading, and inability to follow directions. This array of reading difficulties that interfere with successful work in arithmetic shows that every teacher of arithmetic must also be a teacher of reading.

Deficiencies and strengths in various social traits may be revealed by pupil reactions in the study of social aspects of arithmetic, just as they may appear in the work in the other social studies. The pupil's behavior may reveal shortcomings in such traits as foresight, honesty, industry, initiative, judgment of social values, open-mindedness, self-control, ability to coöperate, thoroughness, and thrift.

## XI. THE ESSENTIALS OF AN EFFECTIVE DEVELOPMENTAL AND REMEDIAL PROGRAM OF ARITHMETICAL INSTRUCTION

An effective program of arithmetical instruction must embody all of the elements that will contribute to optimal growth of all pupils and to the elimination of factors that interfere with this growth. Both diagnostic and remedial work are important constituents of this program

which should not be isolated from it but be made to contribute directly to its success. Many difficulties of pupils grow out of shortcomings of the total program and should not be considered apart from it. The more effectively the program of instruction can be planned, the fewer will be the learning difficulties to overcome. The principles that should underlie the organization of the curriculum in arithmetic from the point of view of both developmental and remedial teaching will be briefly presented in the following paragraphs. These principles grow out of the discussions of basic factors affecting growth in arithmetic presented in the preceding sections of this chapter.

### 1. Organization of Instruction in Fundamental Processes

There should be a reorganization of the arithmetic curriculum in the primary grades. In many schools stress is from the beginning placed on the development of skill in computation. The uniformly low norms based on the performance of pupils in the lower grades reveal the inferior results of this program. The outcomes of experiments to solve this problem suggest two lines along which the reorganization may take place; one, delaying formal instruction in the computational processes until the average pupil has better capacity to master them; the other, substituting for formal work in computation in the primary grades a rich body of experiences intended to develop a background of meaningful quantitative concepts and an appreciation of the uses and functions of number in the affairs of daily life. In later grades, probably the third or fourth, the formal instruction in computational processes should be begun. This work should be integrated with rich educative experiences in which the pupil is introduced to the various contributions that quantitative techniques have made to progress in human affairs.

The organization of practice in arithmetic processes must be individualized so as to make provision for the wide range of individual differences in rates of learning, difficulties encountered, and amounts of practice required. When mass methods of instruction that disregard individual differences prevail, serious difficulties are almost certain to arise in the work of slow pupils. Materials adapted to individual instruction in arithmetic processes have been devised by Courtis, Studebaker, Washburne, Knight, Brueckner, and others. Some, such as those of Courtis and Studebaker, are intended for practice exercises after processes have been taught; some, such as the Compass Remedial Exercises, are intended for remedial work; those of Washburne and of

Brueckner are intended for individualizing the instruction while processes are being learned. In spite of the fact that such efficient, scientifically constructed materials are available, recent surveys show that they are not used as widely as they should be. In the typical school, mass methods of instruction still prevail. The excessive time devoted to instruction in computation is due largely to the use of inefficiently organized practice materials.

Because of differences in the ability of pupils about to begin the work of a grade, the teacher should first give an inventory test on the work of the previous grade, preferably a standardized test with norms for the grade. Such general tests, however, do not give information adequate for planning the remedial program and review work. The more detailed information required can be secured by comprehensive diagnostic tests and exercises, which are available in textbooks, workbooks, and standard drill materials. The teacher should use the test results as the basis for assigning remedial work. Pupils may be grouped according to their needs or the practice may be completely individualized. After a period of study and practice, retests may be given to determine the effectiveness of the work. Such reteaching as may be required should be done. In the case of pupils who fail to make satisfactory progress, a careful diagnosis should be made to determine the causes of the failure. Well-planned remedial exercises should then be assigned. So far as possible, it seems desirable to devise techniques that will enable the pupil to diagnose his own deficiencies and to undertake a self-directed program of improvement under the guidance of the teacher.

After there has been a systematic review of the processes previously taught, new steps may be presented. Here again modern research has made valuable contributions resulting in superior instructional materials that make learning more rapid and much pleasanter. For example, experiments<sup>1</sup> have shown that pupils learn division by single-digit divisors much more easily when the work is written out as long division than when the conventional short division approach is used. Instead of introducing the new process by a difficult example involving many complicated processes, the basic elements and skills are analyzed and a well-graded series of exercises is prepared, in each of which one

<sup>1</sup> F. E. Grossnickle. "An experiment with a one-figure divisor in short and long division," *Elementary School Journal*, 34: 496-507, and 590-600. This study summarizes earlier studies by L. John and H. Olander dealing with the same problem.

new step is presented at a time, then practiced, retested, retaught, and practiced until mastered. Cumulative reviews of these new steps to insure maintenance of the skills taught are also provided. When practice exercises and development units grow out of such a careful analysis of the learning steps, serious gaps in instructional materials are not likely to be found. Experiments have demonstrated conclusively that, when practice is efficiently organized, arithmetical processes can be mastered much more quickly than at present. The judicious use of inventory tests and simple diagnostic exercises makes it possible to individualize the practice on new processes.

Merely having the pupil practice on scientifically constructed practice exercises is not enough. Pupils must be taught economical effective methods of work by the use of models that show how competent workers arrive at solutions. Instead of long, involved explanations that rationalize the process but give no simple statement of procedures to use, the teacher should teach and emphasize short statements of procedure and then, by systematic checking of their methods of work, make certain that the pupils are not substituting involved and inefficient methods of their own.

The results of critical studies of specific sources of difficulties in number processes have enabled authors of instructional materials to devise learning exercises that will greatly reduce the difficulty of these steps. A knowledge of the specific kinds of errors most frequently made in the solution of particular types of examples in a process enables the teacher to avert the development of these faults by providing special exercises to check them when the particular type of example is being taught. When diagnosis of the work of pupils reveals the presence of ineffective procedures, the teacher must painstakingly correct them by teaching the pupil more suitable techniques.

The mental attitude of the learner is an important factor in the learning process. Genuine and legitimate motivation should be a feature of all class work; this is one reason for emphasizing the practical applications and functions of number in experiences of children. Pupils should always be aware of the progress they are making and their growth in ability. To this end, progress charts and graphs should be provided on which the pupil can observe his progress on practice exercises as well as his general growth as determined by standardized tests yielding comparable ratings. Classes in which pupils have definite knowledge of their progress make considerably more improvement

than classes without such knowledge. Standardized progress tests based on the arithmetic curriculum also provide a means by which the teacher and supervisor can determine progress.

## 2. Improving Instruction in Problem-Solving

Experiments show that it is possible to bring about a big improvement in the ability of pupils to solve verbal problems in arithmetic. The following general principles, based on the results of these experiments, are generally accepted as basic in the development of power to solve verbal problems.

1. Having the pupils solve many interesting, well-graded problems during the arithmetic period will yield big returns. More problems of this sort are needed than are now found in some arithmetic textbooks. The teacher should take advantage of the many opportunities that arise in the work of the class in their other subjects to bring out the uses of number processes and to give the pupils concrete experience in the manipulation of number in practical situations.

2. Superior pupils apparently can devise efficient techniques of problem-solving, and they should not be taught a single, set technique. All pupils should be encouraged to suggest solutions when new types of work are presented; that is sounder pedagogically than to assume that solutions must initially be presented by the teacher.

Pupils of average or lower ability often have no systematic method of attacking the solution of problems. Consequently it is believed that these pupils should be taught procedures to use in problem-solving, for without adequate guidance they may invent and acquire very wasteful, uneconomical methods of work. There probably is no single best way for all pupils.

3. Increasing the accuracy of computation in problems by systematically organized practice exercises on number processes and insisting that all computations be checked will increase scores on problem tests by eliminating the numerous errors arising in computation.

4. Exercises in careful reading, of the kind included in many reading and arithmetic textbooks and in supplementary work-type reading materials and arithmetic workbooks, are very helpful. The value of rereading problems should be emphasized. Requiring pupils to restate problems in their own words is a valuable check on their comprehension of the situation presented in a problem.

5. Vocabulary exercises on important arithmetic terms and num-

ber concepts are essential. Buswell<sup>1</sup> has clearly shown the need of this type of work, since many of the technical terms used in arithmetic do not appear in the materials in reading textbooks.

6. Original problems prepared by pupils and concrete applications growing out of local situations and experiences are valuable means of developing in the pupil the ability to 'sense' number relations and to generalize his number concepts. The teacher must make certain that essential relations are educed in such a way that the pupils see the relations in the solution of novel problems.

7. In work on various original problems that require independent study by the pupils, such specific reading skills as use of the index and table of contents, ability to summarize, and the like, are often involved. These reading skills should be taught as part of the instruction in arithmetic.

8. Neatness of work and orderly arrangement of solutions should be emphasized.

9. Standardized progress tests and other methods of showing the pupil his improvement in solving arithmetic problems, applied at regular intervals through the year, are an essential element in a well-rounded arithmetic program.

### 3. Improving Teaching in Other Aspects of Arithmetic

In the suggestions for remedial teaching in processes and problems, emphasis was placed on the necessity of vitalizing instruction through the use of experiences in which number functions in a direct, meaningful way. These activities contribute to the achievement of all of the four functions of arithmetic. However, they can well be supplemented with units of work in which computation as such is a minor, if not wholly missing, element. These units should stress the informational side of arithmetic; they should emphasize the importance of number as a method of thinking, the necessity of clear quantitative concepts, and similar objectives previously listed under the psychological function.

This approach can best be illustrated by indicating suitable topics and activities for the various grade levels that provide opportunity for enrichment.

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<sup>1</sup> G. T. Buswell. *The Vocabulary of Arithmetic* (Supplementary Educational Monograph, No. 36, Chicago: University of Chicago Press).

*Primary Grades:*

- How is the money we pay for stamps used?  
What did the Indians and pioneers use for money?  
How do clocks help us to live together?  
What does the grocer do with the money he receives for things he sells?  
Why do we need fractions of an inch?

*Intermediate Grades:*

- Why do stores have sales?  
How do banks help people?  
Why do stores give discounts?  
In what ways are people paid for the work they do?  
Do all countries use the same units of measurement?

*Upper Grades:*

- Why do banks fail?  
Why doesn't the United States adopt the metric system?  
Which is the better policy, protective tariff or free trade?  
Why do some states have compulsory automobile insurance while others do not?  
Is a system of uniform international money possible?  
How much of the money we pay for a package of cereal does the farmer receive?

The consideration of any of these topics will bring the learner into contact with many important social relationships. To some it will seem as though topics such as those listed are more adapted for work in the social studies than for the arithmetic period, since computation has only a minor place in them. It should be pointed out that the subject matter with which these problems deal is customarily allotted to the arithmetic period but that usually the rich socializing possibilities they provide are not given adequate consideration. Units of instruction developing these topics afford a means of truly vitalizing instruction in arithmetic.

To insure correct concepts and insight, the treatment of these topics must be concrete. The pupils must participate in activities that will help to vitalize the topics. In developing them, the approach by the teacher of arithmetic should be in many respects similar to that used by the teacher of the social studies. The pupils' difficulties will in many respects be the same for both the social studies and arithmetic. Just as difficulties in reading, in written composition, and in oral expression of ideas affect the progress the pupils make in the social stud-

ies, so these difficulties will affect learning in similar units in arithmetic. This makes it clear that the teacher of arithmetic must be prepared to apply the same kinds of remedial measures in reading and expression that the teacher of reading and the social studies must use. The reader is referred to the sections dealing with these subjects for suggestions.

It is self-evident that the introduction of such social units into the arithmetic curriculum requires a much richer variety of supplementary reference materials than most schools now provide. Valuable discussions of related matter appear in many readers, in the *World Almanac*, and in the various children's encyclopedias that most schools now include in their equipment. Current periodical literature also contains a wealth of material to which the teacher may refer the pupils. Over a period of years the school can assemble a variety of helpful materials, such as pictures, clippings, and exhibits. Special reports of private research agencies and government bulletins contain authentic information dealing with many of them. Many pupils may encounter difficulties in locating, assembling, and evaluating the materials dealing with topics they study. The teacher of arithmetic must in many cases therefore give special training to develop the essential reading skills.

## CHAPTER XV

### DIAGNOSIS IN THE SOCIAL STUDIES

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Diagnosis in the social studies, as in all subjects, involves a comparison of achievements with objectives, a search for the explanation of unsatisfactory progress,<sup>1</sup> and the formulation of remedial procedures. In the social studies the whole process is unusually complicated because of the inclusive and ambitious nature of the objectives. Without some tangible standard for purposes of comparison, it is difficult to decide whether or not a pupil is making progress. If the objectives are vague and general, diagnosis will be tentative and approximate. Consequently, the first task confronting a teacher who suspects that a pupil is making unsatisfactory progress is to ascertain as definitely as practicable his specific shortcomings. Such an analysis will necessarily be based on the teacher's conception of what satisfactory achievement is; in other words, what his teaching objectives are. Thus the first step in a general survey of diagnosis in the social studies involves a statement of some accepted objectives.

#### I. OBJECTIVES

Objectives in the social studies may be summarized under four headings: (1) statements of the comprehensive social purpose, (2) information and knowledge, (3) social qualities and traits of personality, and (4) special skills and abilities. General statements of the comprehensive social purpose include, of course, the more specific objectives listed under the other three headings. We shall see that intangible, general objectives, valuable as they may be for social and educational guidance, are impracticable in a program of diagnosis within the schools. The second class of objectives includes the commonly accepted bodies of information and knowledge. These will afford rather

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<sup>1</sup> "Unsatisfactory progress," as used in this chapter, refers not only to falling work but also to all work of a quality poorer than the pupil or class is capable of achieving.

specific standards by which to measure progress. The third class of objectives includes those personal qualities and powers which are individually desirable and which promote social living. They, too, contain many specific elements that serve as a basis for diagnosis. The fourth class includes specific skills and abilities essential to successful work in the social studies.

### 1. Comprehensive Social Objectives

Many attempts have been made to formulate the 'supreme,' the 'major,' the 'fundamental,' or the 'ultimate' objective of the social studies. It has been said that these subjects have for their purpose "the creation of rich, many-sided personalities" who can function in a progressive social order; that an understanding of the world is the principal contribution of the studies; that they enable the pupil to adapt himself to his environment; that they teach the pupil how to guide, enrich, and motivate life's activities. No one will deny the value of setting up such ideals. They enrich one's appreciation of the purposes of all social activities. They furnish that indispensable touchstone of values without which the details of information and the multiplication of skills would be fortuitous and purposeless. Such statements, however, tend to emphasize the indescribable nature of life rather than the unity or sufficiency of the social studies. They seem to imply that the social studies are alone in the educational vineyard or else that they are performing an inequitable share of the labor. But it can be reasonably asserted that arithmetic, typewriting, and art can make valuable contributions toward the attainment of these inclusive objectives. Stated in such a philosophical and comprehensive manner, these objectives become synonymous with the aims of education or the purposes of life. They afford valuable ideals and indicate desirable possibilities. They do not afford, however, any very tangible bases for a program of diagnosis.

Let us suppose, for example, that the inclusive objective of the social studies is 'an understanding of the world.' This will mean various things to various people; in most cases it will mean the understanding of the world possessed by the teacher himself, for that is his only standard of measurement. He can estimate in a vague sort of way whether the pupil is progressing toward such an understanding; he can formulate some general theories to explain unsatisfactory progress; and he can, by new devices and additional methods, stimulate the pupil to greater efforts. Such a program of diagnosis would be individualistic

and highly impressionistic. It might have value, but it would of necessity be an intangible value.

The explanation for the inefficacy of diagnosis under such conditions is to be found in the nature of the objectives. When considered in terms of educational necessity, they violate the well-established principle that an objective for a subject should be attainable through that subject only or attainable more advantageously through it than through other materials. All subjects probably have contributory values and incidental relationships that extend into other fields. Such values and relationships, however, cannot be justifiably described as objectives of particular subjects. Thus we arrive at the conclusion that, for purposes of diagnosis in the social studies, more tangible objectives must be set up.

## 2. Informational Objectives

The ultimate philosophical objective cannot be achieved directly or immediately. Neither can the desired personal qualities and powers be developed without the use of intermediary materials. Temporary objectives, consisting of information (knowledge), may be set up in order to make progress toward ultimate objectives. Learning the area of France, the date of the Louisiana Purchase, and the number of union laborers in the United States may not constitute objectives of momentous importance, but every teacher recognizes that they represent types of temporary milestones that must be passed in order to reach the more significant goals. The number of temporary, or intermediate, objectives that might be utilized is almost as great as the number of facts that make up the content of the social studies. Only a general survey of them can be given here. Perhaps there is no better way of indicating these informational objectives of the social studies than by giving a summary outline of the contents of the social subjects.

1. The informational objectives of geography include the descriptive facts about the earth: its size and shape; its surface divisions, such as plains, valleys, mountains, lakes, rivers, oceans, etc.; its climate; its inorganic products, such as minerals; its organic products, such as animals and plants; and systems of division and measurement, including zones, latitude, longitude, degrees, areas, etc. In addition to these facts about the earth, geography includes a study of man's use of them. It shows how he has utilized resources, how he has migrated to more favorable regions, how he has modified his environment, and how he has measured, mapped, and recorded geographic facts for his use. Other

aspects of geography include a study of the division of the earth into political states and lesser subdivisions and of how these political units are related to physical features and resources. Geography thus tells how the earth has conditioned man's activities and how man has adapted himself to these conditions. It is the study of the interrelations of man and earth.

2. The informational objectives of civics include constitutions, forms, and kinds of government, such as federal and centralized; aristocratic, monarchical, and democratic; executive, legislative, and judicial. Civics also includes a study of the functions of government, such as carrying on war; maintaining international relations; regulating economic activity; protecting life and property; promoting education, health, safety, and culture. The subject also involves political theory and a consideration of the constant struggle to reconcile liberty and authority.

3. In history the informational objectives are, in practice, largely specific. The completeness of the actualities considered and their remoteness from the confusing problems of the day tend to simplify their treatment. History is a record of past politics, past economics, past geography, and past sociology systematically developed, not omitting attention to time sequence. History may be thought of as epochs of time. As such it is divided into primitive, ancient, medieval, modern, and contemporary. Again history may be considered as regional, such as the history of Illinois, the United States, or Europe; or it may be regarded as a study of culture types, such as primitive, agricultural, urban, national, or imperial. Within any of these frameworks, it will deal with kinds of government, economic activities, wars, social institutions, religion, education, the arts, and everyday life. History thus seeks to preserve records of all kinds of human activities.

Even though economics and sociology are not taught as such in the elementary schools, much of their content is utilized in geography, history, and civics. Consequently, it seems desirable, for the sake of completeness, to include them in this consideration of the objectives of the social studies.

4. The informational objectives of economics include the production of commodities and services and their distribution through wages, interest, rent, and profit. Economics deals with material and human resources, capital, technology, business organization, and the regulation of economic activity by public and private forces. It also deals with exchange, including the vast array of money, banks, prices, and

trade. It treats the theoretical, as well as the actual, division of economic goods among workers, capitalists, landlords, and entrepreneurs. In short, the subject is concerned with man as the creator and spender of wealth.

5. Sociology deals with human institutions, such as the family, the school, the neighborhood, and the state. It seeks to present an analysis of social interaction in all its diverse manifestations. It presents types of culture, varying standards of conduct, descriptions of social communication, and accounts of social control, both promotive and restrictive.

6. In some schools new types of courses are being developed in which various aspects of the social studies are combined or fused in new ways. There is at present little uniformity in practices in these curricula, but in their essentials they stress the acquisition of information similar to that included in the foregoing social studies.

This summary of the informational, or intermediate, objectives of the social studies indicates the boundaries within which almost numberless items may be found. It in no wise indicates the necessary details or the 'minimal essentials,' for an 'essential' for one pupil may not be such for another; a person may arrive at a generalization or gain an insight by various paths. The informational objectives here indicated do illustrate the day-by-day tasks that teachers set up. Temporary in nature, they are none the less indispensable both for the acquisition of qualities and powers and for the attainment of the ultimate goal that society may dictate. They thus afford specific standards by which to measure actual accomplishment; in other words, they furnish a basis for diagnosis.

### 3. Social Qualities and Personality Traits

In addition to the ultimate social and the knowledge-information objectives, the social studies are also designed to contribute to the growth of numerous social qualities and traits of personality. Although personal in the sense of possession and expression, these qualities and powers have large social implications. This statement of them is therefore not designed to emphasize individualism at the expense of collectivism, but merely to indicate that they must be acquired by individuals.

a. *Habits.* A long list of habits desirable for success in the social studies could be compiled. Most of them would also be desirable in the study of all subjects, but those habits that seem to be most requisite

in the social studies include neatness, industry, courtesy, promptness, accuracy, coöperation, and patience.

*b. Attitudes.* An attitude, although held and expressed by an individual, cannot remain merely an individual matter. Its very existence, and certainly its expression, becomes a social affair. It is, when exhibited, a form of communication and so touches the heart of the social body. Harmful or negative attitudes offer no help toward the improvement of society; so the social studies are committed to the inculcation of such attitudes as will promote successful group living. Among the more important may be mentioned respect for others, patriotism, pride in human achievement, faith in the possibilities of human progress, admiration for unselfish and heroic deeds, interest in contemporary affairs, sympathy, helpfulness, appreciation, tolerance, fairness, broad-mindedness, and love of peace.

*c. Allegiances.* The social studies stress certain ideals and standards and try to enlist the allegiance of the pupil toward promoting those ends. Some ideals that deserve this allegiance are liberty, democracy, the worth of human life, the right to individuality, the value of labor, and the obligation to promote community values.

*d. Leadership.* The social studies are committed to the development of those powers and capacities that will enable outstanding students to become leaders. Such powers are perhaps desirable for every individual, but relatively few will actually acquire them in a degree sufficient for leadership on a large scale. Some of the qualities requisite for leadership are will-power, courage, independence, initiative, imagination, creativeness, and watchfulness.

*e. Health.* The individual and social aspects of a quality as an objective are well illustrated in the field of health. Personal hygiene is so indissolubly intertwined with group health as to be inseparable. The individual soon learns that he performs such intimate tasks as brushing his teeth partly for the sake of personal relations. He soon realizes that sanitation must be a group enterprise, that health cannot often continue to be an individual matter. Hospitals, health organizations, and public regulations are predicated upon the assumption that society profits by the improved health of individuals, for sickness is not only an individual but also a social cost. Thus the facts about health become informational objectives, and the development of a social consciousness in health becomes an objective involving traits and qualities of personality.

#### 4. Specific Skills and Abilities

Progress in all subjects requires the acquisition of various kinds of skills. Some of them are applicable to many different subjects, and some are of peculiar utility in the social studies.

*a. Finding Information.* No skill is more frequently needed in the social studies than that which enables the pupil to find expeditiously the desired information. This skill involves a thorough knowledge of the utility of various parts of a book, of what one may expect to learn from the title page, the table of contents, lists of maps and illustrations, appendices, and index. The one who possesses such skill will use the index to find an item rather than page through the book. Skill in finding information involves the ability to use catalogs, guides, bibliographies, references, and the myriad avenues that lead to the desired items. It involves some definite conception of the practical categories for classifying materials.

*b. Reading Understandingly.* Skill in finding material must be seconded by the ability to read and understand it. This involves reading for various purposes — for entertainment, for general ideas, for evidence, for selected kinds of details, for seeing a logical organization, for appreciation, etc. This skill also involves the understanding of maps, pictures, charts, diagrams, tables, and social data of various kinds. Even more significant, it involves the discernment of truth amid conflicting statements, the ability to judge the degree of probability of the truth or falsity of a given statement; in short, it involves the ability to analyze materials by sifting the significant from the insignificant, the relevant from the irrelevant.

*c. Using Information.* Skill in finding and understanding materials must be followed by the ability to utilize them. This may involve a quotation or a citation, but it may include the reconstruction of it into a new pattern or complex. This new synthesis involves the placing of major and minor points in proper perspective, presenting the elements from the sources in an appealing form, and setting forth the new synthesis in fitting words. In some instances, skill in utilizing information may involve the making of charts, diagrams, tables, and maps.

*d. Remembering Information.* Another skill that must accompany all these processes is that of knowing how to remember the needed information. In spite of the constant use that may be made of reliable materials, the good student must have a trained memory, one that will furnish him instantly and reliably many of the necessary facts. It is

not possible to make comparisons, or to evaluate statements, or reconstruct materials without this ability to reconstruct mentally the materials read.

This summary of objectives does not approach completeness. Other writers would have made a different selection and statement, but most of those stated here would appear in any inclusive list. Those actually given or implied will be sufficient for the purpose of indicating worthy aims. Having established some standards of desirable accomplishment, let us see what means are available for detecting unsatisfactory progress toward them.

## II. METHODS OF DISCOVERING UNSATISFACTORY PROGRESS

### 1. Toward the Comprehensive Social Objectives

Techniques for measuring progress toward an ideal are necessarily somewhat subjective, approximate, and impressionistic. So many of the objectives of the social studies are intangible that it is difficult to ascertain either the distance from the goal or the rate of progress toward it. This is peculiarly true of the comprehensive objectives that are synonymous with the aims of education or the purposes of life. Thus, the problem of discovering satisfactory or unsatisfactory progress toward the ideals of the social studies is similar to the problem of trying to decide whether society is making progress. If the world is growing better, it may be reasonable to assume that some of the credit for such advancement belongs to the schools, and because of the very nature of the social studies, they will be inclined to claim a major share of the credit.

Various criteria of social progress might be set up. In application most of them would raise perplexing problems. Suppose, for example, that an increase in the number of playgrounds is regarded as one indication of social progress. Is the increase in proportion to the increase in population or merely a flat increase? Is the increase evidence of increased utilization? Is there a corresponding increase in equipment and supervision? Is the existence of playgrounds in urban centers evidence of progress beyond the former rural condition in which they were unnecessary? These questions are raised about a relatively simple index of progress. Suppose our criterion of progress were a "decrease of corruption in public office."<sup>1</sup> What is meant by "corruption in

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<sup>1</sup> These two examples are taken from William C. Bagley, *Education and Emergent Man*, 121, 120 (Nelson, New York, 1934). Bagley says, after giving

public office"? Does it include all instances of nepotism? Is an official who ignores the law, rejects a bid for equipment, and later purchases it at an enormous saving guilty of 'corruption'? What quantitative or qualitative measures of corruption in public office during past periods are available? Are such measures available and applicable today? If corruption declines for twenty years and then increases for a decade, has there been an increase or a decrease? Is the wrongful act of a high official more corrupt than a similar act by a lowly official?

In spite of the difficulties of application, some criteria of social progress would seem to be desirable. Those which have been proposed by Bagley include percentage of children enrolled in school, decrease in crime, improved health, decrease in the number of inmates of eleemosynary and penal institutions, decrease in disease, increased longevity, increase in the percentage of voters, increase in patents, increase in the sale and circulation of books, increase of learned societies, expansion of world trade, and the lessening of provincialism. The list is perhaps a mixture of the significant and the less significant. It could easily be expanded, but our examination of the two samples indicates the difficulties that confront any one who seriously tries to apply these criteria. The measurement of general progress toward a comprehensive goal will probably remain in the realm of opinion and judgment. Similar limitations make difficult the measurement of progress toward the ideals set up by the teachers of social studies.

## 2. Toward Informational Objectives

Methods of discovering progress, or the lack of it, toward informational objectives are numerous and fairly satisfactory. Oral questioning, formal recitations, discussion tests, objective tests, participation in group discussion, problems, projects, and personal interviews are serviceable in revealing the degree of success attained by the pupil. Suppose, for example, that the assignment involves learning five classes of people who settled in the English colonies along the Atlantic coast. The specific nature of the information facilitates the discovery of failure or partial success. Any of the methods just mentioned and perhaps others could be utilized. Not all informational objectives are so specific, but most of them are susceptible of measurement.

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about twenty other criteria, "For most of the criteria here set forth quantitative measures are available or could be made available."

### 3. Toward the Objective of Social Qualities, Personality Traits, and Specific Abilities

The discovery of progress toward the acquisition of a power or quality is more difficult than measuring progress toward an informational objective. Even when the information has been learned, the pupil may be no nearer the goal of ability to generalize, to find materials, or to select significant elements. The positive correlation between the possession of information and the presence of desirable powers and qualities has led many teachers to assume the proper utilization of the raw material. Since, however, the correlation is not complete, there remains the problem of discovering methods by which to measure progress toward the attainment of powers and qualities of personality.

The health of a pupil can be determined with reasonable accuracy by a physical examination; his sense of responsibility in preserving and promoting community health is a more elusive factor. The ability to utilize a card catalog, an index, or a bibliography can be ascertained; the ability to analyze what is read and make a new synthesis is not so easily measured. The degree to which a pupil has acquired the habit of neatness or promptness is difficult to measure, for such qualities tend to be specific rather than general. The English teacher may declare that Armand is prompt and neat; whereas the history teacher may offer proof that Armand is both irregular and untidy. The same irregularity and inconsistency characterize the exhibition of attitudes, allegiances, and qualities of leadership. What methods, then, are available for detecting progress toward these elusive powers and qualities? Accepting whatever measures progress toward an informational objective as valuable as an indication, what methods are applicable more directly?

The most frequently used methods of checking progress in the attainment of powers and qualities are observations of behavior and reactions, recitations, problems, and projects, case studies, interviews, and tests. Consistent and careful observation of a pupil's behavior will lead to fairly reliable conclusions as to his progress toward the acquisition of some quality or power. Case studies that throw light upon extra-school activities and environment can, in some instances, be utilized.

The other methods are frequently used, for the teacher is constantly trying to evaluate the pupil's progress toward worthy goals. Recognizing that most of these methods have yielded inexact and rather vague

results, many persons have tried to refine the objective test so that it would measure directly these significant, but somewhat intangible, powers and qualities. Tests for the measurement of many qualities and powers have been attempted. Those designed to measure judgment, time sense, place sense, historical-mindedness, sequential relations, ability to generalize, and other advanced types of mental activity, thereby revealing powers and qualities, have met with varying degrees of acceptance.<sup>1</sup> The teacher will try to select the test that undertakes to measure the quality or ability toward the attainment of which he is directing his pupils.

### III. FACTORS ASSOCIATED WITH UNSATISFACTORY PROGRESS IN THE SOCIAL STUDIES

Thus far we have stated some objectives in the social studies and have suggested methods for determining the pupil's progress toward these objectives. The third step in a program of diagnosis is to discover the reasons for unsatisfactory progress, or to be more exact, to consider the associated factors. They are numerous and varied. For purposes of convenience they may be divided into two main groups: (1) the general factors that might be associated with poor performance in any subject, but that are also operative in the social studies, and (2) the factors that are peculiar to, or especially significant in, the social studies.

#### 1. General Factors

a. *Intelligence.* One general factor associated with school achievement is that of intelligence. From time immemorial, men have been rated as brilliant or dull, competent or incompetent, or within these extremes. The development of intelligence tests has enabled teachers to secure fairly reliable indications of what to expect from a given pupil. The interrelation of progress toward an informational objective and intelligence is apparent when one recalls that practically all studies of intelligence have reported a high positive correlation between that factor and the amount of information. This statement does not mean that the two factors are inseparable, but that they are found together in such constant ratio as to indicate a mutual interdependence.

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<sup>1</sup> Edgar B. Wesley and Renata R. Wasson, "Testing the Understanding of Ideas," *Studies in College Examinations* (Bureau of Educational Research, University of Minnesota, Minneapolis, 1934), 67-74. Several articles in the same bulletin bear upon this problem.

Having recognized that intelligence is a factor in school achievement, the teacher will, however, guard against placing too much faith in scores made on intelligence tests. This caution is necessary even when the tests are administered by experts, and it is imperative when they are given by teachers who are more likely to make errors of computation and interpretation. And it is well to remember that intelligence is not the sole factor underlying achievement. Other factors — promptness, neatness, persistence, honesty, and other personality traits — have enormous influence. High intelligence indicates the possibility of high achievement; unfortunately it does not guarantee it. Neither does a comparatively low intelligence necessarily consign a pupil to failure. Perhaps the most significant conclusion to be drawn from a pupil's intelligence score is that it indicates his probable performance if other factors are equal.

*b. Health.* The factor of health undoubtedly has a bearing upon school performance. Sustained reading, written reports, and formal oral reports in class, such as are frequently prescribed in the social studies, require energy as well as intelligence. Consequently these tasks should not be laid upon one who is below normal physically. The increased attention given in recent years to sight, hearing, weight, and general physical condition has lessened the number of pupils who have failed because of such physical difficulties. In spite, however, of school doctors and nurses the alert teacher will be constantly solicitous of the physical condition of his pupils.

*c. Social Adjustment.* A third general factor of a rather complicated nature may be indicated by the phrase 'social adjustment.' Operative in all subjects, this factor is especially significant in the social studies. It involves the whole problem of the pupil's status in the school: his relations with teachers and fellow-students, his standing in extra-curricular activities, and his attitude toward school work. The pupil who is out of harmony with his associates cannot do effective school work. The dissatisfied pupil thus constitutes a problem case that can usually be solved only by individual attention and study. Sometimes the study of the social adjustment of a pupil involves the relations between the pupil and one teacher only; again it may involve the pupil's relationships in only one class. Whatever be the range, the problem will involve baffling personality traits, such as inhibited inclinations, distorted attitudes, super-sensitive feelings, and twisted personalities. Whether the problem is one which suffuses the whole

life of the pupil or whether it is merely local and specific, it must be considered and treated.

*d. Extra-School Environment.* A fourth general factor bearing upon achievement in the social studies as well as in other subjects is that of extra-school environment. The aspects of this factor are varied and bewilderingly complex. They may involve poor food, unsanitary and uncomfortable quarters, employment, lack of opportunity for study, discordant home life, unpleasant relations with some member of the family, or poverty, with its inevitable restrictions upon any enlarged socialization. Only an investigator or visiting teacher can learn the details of a particular case, but the teacher can maintain a sympathetic attitude toward a problem, the details of which he does not know. In casting about for explanations of unsatisfactory progress, this factor of extra-school environment must not be overlooked.

*e. Incentives.* Lack of incentives, with the consequent absence of motivation, is a factor that tends to lessen pupil achievement. It is of peculiar significance in the social studies because the occupational or utilitarian incentives are not so apparent as in some of the other subjects. Consequently the teacher must stress interest, build up temporary motivation, and emphasize such values as will appeal to the pupil.

*f. Application.* A general factor tending to lessen achievement in all school subjects is that of the lack of application. The expenditure of effort seems to be a psychological necessity, and when a pupil is disinclined to apply himself, he is destined, no matter how talented, to do unsatisfactory work. Lack of ability, absence of motivation, or improper materials, or any other factor may be a contributory cause of the failure in application. It is advisable, of course, for the teacher to try to find these contributory causes. There are, however, some instances in which sheer indifference, laziness, or unwillingness to expend the required energy may be the true explanation for the lack of application.

*g. Freedom from Distractions.* Reading and study require not only application but also freedom from distractions. Such freedom is especially necessary in the social studies because they so frequently involve extensive and intensive reading and the careful preparation of written assignments. If study halls, libraries, and homes do not afford suitable settings for study, the performance is bound to be unsatisfactory. Lack of order, outside noises, competing attractions, talkative com-

panions, and social occasions are some distractions to which the pupil is frequently subjected. This factor is probably irregular, but if one can believe pupil reports, it occurs with distressing frequency when some special work is due or when an unusually important assignment has been made. In all probability distractions do not constitute a major factor in unsatisfactory progress, but since they are tangible and removable obstacles, they deserve attention.

*h. Adequate Time.* Perhaps no excuse for poor or inadequate preparation exceeds in frequency that of insufficient time. In reality, the pupil is often confronted simultaneously with heavy assignments, extra-curricular activities, the necessity of doing delayed work, and distractions at home. Insofar as the excuse is justified, it can be remedied by more careful planning by the pupil and the teacher, jointly and individually.

*i. Quality of Teaching.* Another reason for unsatisfactory progress is that of poor teaching. Often unrealized by both the pupil and the teacher, this factor nevertheless operates with distressing frequency. It may range all the way from ignorance of materials to unpedagogical methods, from time-serving to over-earnestness, from killing the spirit by persistent drill to constant but nebulous enthusiasms. The range, causes, and manifestations of this factor engage the attention of teachers and supervisors; self-scrutiny and self-administered remedies might tend to lessen its operation.

*j. Materials of Instruction.* In the social studies unsuitable materials are a frequent cause of unsatisfactory progress. Operative in all subjects, this factor is especially significant in the social studies because of the necessity of extensive reading in a wide variety of materials, and because of the problem of ascertaining the difficulty of the materials. Perhaps the specific nature of this factor will be clearer if we recall that materials may be unsuitable because they are poorly graded or because they are inappropriate.

## 2. Special Factors

Under the previous heading we considered the general factors associated with unsatisfactory progress; we now deal with those that are peculiar to, or at least especially significant in, the social studies. Naturally it is not possible to draw a sharp line between the general and the specific factors that affect progress within a subject.

*a. Experience.* Experience is preliminary to all complete learning. The lack of it on the part of pupils nullifies many efforts of the teacher

and reduces much of the content material to hollow verbalisms. Lack of experience in the materials of the social studies does not always mean the lack of an identical experience. None of us can have the experience of resigning a throne, joining the Crusaders, or going down with the Titanic. Lack of experience means then the absence of elements similar to those that are described and that are necessary for an understanding of an event, situation, or idea. Whether a given experience will furnish the elements necessary for the reconstruction of a desired actuality depends upon a number of factors, such as the richness of the experience, the sensitivity of the person, the degree of identity or similarity of the elements, and the skill with which the desired actuality is presented. But the point here is to stress the necessity of basic experiences out of which new experiences can be created. Without such experiences the pupil grasps a word here and there, but he fails to encompass the central idea because it is beyond the range of similar elements in his own experience. Let us consider an example.

A class was studying the subject of transportation and came to a consideration of the transfer of money by means of checks and money orders. Several members had received checks or money orders through the mail. The transfer of money by telegraph was then mentioned. Some of the pupils were frankly incredulous, for they apparently tried to visualize a check or a sum of money gliding along the wires. But one alert boy came to the rescue and told how his father had sent him some money by telegraph when he was in a distant city. Such a transfer was real to him because he had had the experience.

Another example is that of a teacher who was describing a siege. She commented upon the enormous advantage which the defendants had because of several well-manned bastions. Inquiry disclosed the fact that only two of the class had ever seen a fort, and neither of them had any idea of what a 'bastion' was. The experiences of the class were too limited to render the concept of any immediate value.

Many topics in history fall outside the experiences of the pupils. Consider, for example, the Diplomatic Revolution of 1756. 'Diplomacy' itself is a rather nebulous concept, and its chaotic nature is emphasized by tying it to an apparently distorted use of the word 'revolution.' The result is that the diplomats, if they are mentioned at all, remain shadowy figures, and the pupil secures only a vague and unreal idea of this significant and dramatic shift in European alignments. This illustration emphasizes the point that the materials of study must be within the range of experiences containing similar ele-

ments, and those similar elements must be identified and related to the new materials.

Lack of experience is a cause of unsatisfactory progress, not only in dealing with events, names, and facts, but also in trying to understand human relationships. For example, the pupil will have difficulty in understanding how the American patriots felt toward the Loyalists unless he himself has run the risk of having some cherished desire thwarted by the opposition or indifference of supposed friends. The awed feeling with which a provincial governor bowed before the Roman emperor will be more keenly realized if the pupil himself has felt a sense of humility and awe as he met an important personage. An example of human relationships that remains unreal for most pupils is that relating to the contest between Henry IV of Germany and Pope Gregory. The essential facts are presented in many history texts, but they are so far from the pupil's experience that they have little significance for him. He is likely to finish the topic wondering why Henry was so anxious to see the Pope, why the Pope made him wait, and what it was that was important enough to cause Henry to stand waiting for three days. The physical situation is easily grasped; the problem in human relations remains a closed book.

*b. Vocabulary.* Progress in the social studies is dependent upon an adequate vocabulary. Next to the lack of experience, perhaps the most fundamental difficulty in the field is that associated with word difficulty. In fact, experiences themselves lose much of their value and significance when they are unticketed and unnamed. Conversation and writing would be impossible without the system of identification tags that we call 'words.' Experience furnishes the basis, and the word serves as the means of recall for purposes of thinking, writing, and talking. The inadequate vocabulary may be the result of the lack of experience. In either case an inadequate understanding leads to the use of empty words, which are usually called 'verbalisms.'

The presence of verbalisms indicates the lack of experience or incomplete identification of experience, together with an attempt to use a word whose meaning is inadequately known or altogether unknown. The use of a verbalism thus evidences unsatisfactory teaching or learning. The exigencies of the assignment or the recitation have caused the pupil to repeat what he does not understand. Continued repetition confirms the error and increases the difficulty of correction. The detection

of verbalisms requires alertness and skill, for the pupil develops considerable art in vain repetitions.

Every experienced teacher can cite instances of amusing verbalisms. The most extreme example the writer has encountered recently was in connection with the recital of the salute to the flag. He noticed that the closing words of the salute as recited by a six-year-old boy sounded inexact. The pupil was asked to repeat the closing phrase very carefully. What he actually said was "and just as far off" instead of the phrase "and justice for all." This amusing error is evidence of oral learning, but it also shows that "just as far off" was as meaningful to the boy as "justice for all." A fourteen-year-old boy was asked to define 'budget.' He answered that it was "the sum of money not needed for expenses."

Verbalisms are not only evidence of inexact learning; they are also the source of further misunderstandings. For example, the boy who thinks that a budget is "the sum of money not needed for expenses" will probably secure erroneous notions of all statements in which the word is used. Oft-repeated verbalisms come to have the sound of reality, and every teacher realizes that they have the vitality of error.

Verbalisms constitute but one type of weakness in the vocabulary of the social studies. Unknown words also stand as barriers to understanding. One unknown word in a sentence endangers its whole meaning. Fortunately the enormous attention given to the problem of diction in recent years has tended to make teachers and textbook writers aware of the necessity of using words that are likely to fall within the range of the pupils of the grade for which the book is designed. In a later section we shall note some of the efforts which have been made to solve the problem of diction.

*c. Expanding Meanings.* Equal in importance to these factors, lack of experience and an inadequate vocabulary, is the failure to expand the meanings of words that have been learned. It is easy for a pupil, since he knows one use or meaning of a word, to assume that he knows it in its entirety. The writer recently encountered difficulty in convincing a college junior that the word 'law' could be correctly applied to a generally accepted principle or tendency. The student had restricted the word to statutory enactments and so resented its application to another type of idea. A word is an expansive and inclusive label which can be attached to varying phenomena by various people; consequently one's appreciation of a particular word is dependent upon

the extent of his experience with it. A word is a generalization, and one's insight into a generalization is measured by his knowledge of the detailed instances upon which it rests.

Degrees, or levels, in the meaning of a word can be interestingly illustrated by asking a group of pupils of varying ages to define a given word. Start with the youngest and go up the grade scale, asking each pupil to give his idea of the word. For example, the word 'bank' means 'a building,' 'a place to deposit money,' 'a place to borrow money,' 'an organization that pays interest,' 'a place to keep jewelry,' 'a place through which to pay bills,' and 'a medium of financial exchange.' The more advanced the pupil is, the more developed and inclusive will be his idea of a bank. The experiment will also show how easy it is to select a word that will awaken no responses whatever or decidedly inadequate responses from pupils in the lower grades.

Failure to appreciate the expansibility of words leads to a false sense of mastery, to misunderstandings, and to actual opposition to uses of a word in ways that are strange to the pupil. This factor is of peculiar significance in the social studies because their terminology is delusively easy. The usual, everyday meaning of a word is frequently assumed to be its total meaning. No one pretends to know technical words of a science unless he does, but most people will assume that they know the various connotations of words used in the social studies. It is thus wise to be aware of this tendency to restrict words, to deny them an elastic quality.

*d. Learning Vicariously.* A fourth factor of equal significance is that of weakness in vicarious learning. Since most of the materials in the social studies deal with actualities beyond the possible experience of one individual, the enormous importance of vicarious learning becomes apparent. While experience must furnish the basis of learning, it is not possible or even desirable to restrict what is learned only to what may be experienced. There are more economical ways. In fact, schools are founded upon the assumption that teachers can save pupils from the necessity of directly experiencing many aspects, that there are royal roads to learning. If, then, a pupil seems to learn only from experience, he is limiting his possibilities. Perhaps weakness or lack of facility in vicarious learning is the result of a slothful imagination, the failure to recognize the elements of a new actuality as being similar to those from one's own experience. In other instances the new material may be so presented as to obscure the similar elements. Whatever be

the nature or cause of inaptitude in vicarious learning, it must be remedied, so that the pupil may see what he has never seen, hear what he has never heard, go where he has never gone, experience what he has never experienced. Only by this process is he able to extend his world beyond the narrow confines of physical or mental experience. It is the height of naivety to declare that the child learns only from direct, personal experience.

e. *Skills.* Poorly developed skills account for many instances of unsatisfactory progress in the social studies. This factor may range from helpless inability to use a card catalog to weakness in organizing material. The following tabulation of some of the difficulties is self-explanatory:

1. Lack of skill in locating material by using
  - a. library files
  - b. references, guides, and bibliographies
  - c. dictionaries and encyclopedias
  - d. proper book for a given purpose
  - e. index
  - f. table of contents
  - g. appendix
2. Lack of skill in understanding materials readily<sup>1</sup>
  - a. by careful, detailed reading
  - b. by hasty skimming
  - c. by concentrating upon relevant portions
  - d. by recalling, comparing, and checking with former materials
  - e. by use of charts, diagrams, tables, etc.
3. Lack of skill in synthesizing materials by
  - a. assembling similar ideas from different sources
  - b. utilizing only related points for the process
  - c. testing the accuracy of statements
  - d. separating major and minor points
  - e. using a logical structure
  - f. mastering the mechanics of systematic talking and writing

f. *Sense of Time.* An inadequate sense of time is a factor that operates more noticeably in the social studies than in other subjects. The pupil may have little realization of even short periods of time, and years may be for him as mere astronomical vagaries. Until a rather definite time sense has developed, the pupil cannot appreciate cause

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<sup>1</sup> For a more extended account of reading difficulties see Dr. Monroe's discussion of reading, Chapter XII.

and effect or sequential relationships. In other words, he cannot understand a chronological or even a genetic approach to the study of a topic. Whether chronology has a mathematical basis or whether it grows only as a result of association with events is a problem that has not been satisfactorily solved. The process of growth in developing a time sense, however, is fairly well understood. It seems to grow with age, and teachers can, as we shall see in the next section, assist the process by various aids. Mary Sturt<sup>1</sup> and Mary G. Kelty<sup>2</sup> have made careful studies of the order in which various time concepts develop. Their studies offer fruitful suggestion for the grading of time expressions.

*g. Sense of Place.* Equal in importance to the time sense is that of place sense, which involves directions, areas, and all kinds of geographic measurements. Social actualities occur at some time and in some place. The two factors seem to be not only aids in understanding and remembering actualities but also integral parts of them. In fact, new actualities can scarcely be imagined without the accompanying factors of time and place. Consequently, vague and unreal concepts of place result in vague and unreal concepts of the actualities described. This probably means in practice that the pupil must know some geography in order to understand social actualities; without the necessary skills in reading maps, tables, and charts he cannot acquire the necessary geographic knowledge. Teachers can cite amusing instances of geographic ignorance, and most of them illustrate the lack of a fundamental sense of place. Children are apparently satisfied with the crudest notions of direction, space, and measurements. Many college students do not understand Mercator's Projection or how to read a weather map. As long as a pupil has a vague sense of place, he is likely to have only a vague realization of what occurred in a designated place.

*h. Materials.* Inadequate and unsuitable materials constitute one of the most frequent causes of unsatisfactory progress, affecting the capable as well as the poor student. Considering the extent and variety of the materials in the social studies, it is not surprising that much of it is unwisely selected, poorly graded, insufficient in extent, or unsuitable for other reasons. One aspect of this factor is the all-too-frequent paucity or total lack of reference books and supplementary reading matter. Condensed summaries, such as general texts must necessarily provide, often constitute the only reading material for the class. Teachers sense

<sup>1</sup> *The Psychology of Time*, London, 1925.

<sup>2</sup> "Time expressions comprehended by children of the elementary school." *Elementary School Journal*, 25: 522-528.

the difficulty and sometimes mistakenly assume that a small text can be detailed and inclusive, that it can remain as a text and yet supply the rich, detailed, and colorful content of a library. This deficiency of material can scarcely be classified as a learning difficulty, but it does operate as a factor in causing unsatisfactory progress.

Another aspect of the problem of materials is the supposed necessity of covering the ground indicated in syllabi. This mistaken zeal for accomplishing an apparently tangible objective often leads to faulty diagnosis and unfair criticisms of pupils and materials. The attempt to cover the ground indicated by courses of study and texts often leads to the inclusion of ill-chosen topics unsuited for the class and unadapted to the objective. A recent survey<sup>1</sup> of classroom difficulties demonstrates this tendency. Teachers reported such topics as 'tariff,' 'finance,' 'political parties,' 'elections,' and 'banks' as troublesome. It is possible that a great deal of the difficulty arises from the attempt to make premature presentations; in other words, the topics are poorly graded. Insufficient books and the effort to encompass too much ground by no means account for all the difficulties in connection with materials. The utmost care in the selection of texts and references will not result in the complete elimination of material that is abstract, condensed, biased, obscure, poorly organized, and presented in difficult diction.

*i. Social Sense.* An inadequate social sense hampers progress in the social studies. Perhaps this factor is rather intangible, but it is none the less real. It manifests itself in the inability to visualize a person from the pages of history; in the failure to understand group activities; in a lack of an appreciation of the difference between persons individually and collectively; in the vagueness with which social institutions are grasped; and in the non-awareness of social interdependence. The factor may reveal itself in a general attitude of regarding past events and persons as wooden, mechanical, or automatic. Again, it seems to manifest itself through a sentimental, heroic attitude rather than a realistic one. Whatever be its manifestations, the basic cause seems to be social inexperience. Only time and activities can remove the cause and enlarge the pupil's understanding. Some of the activities, as we shall note in the next section, can be provided by the school.

*j. Attitudes.* Attitudes, both desirable and undesirable, are more

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<sup>1</sup> Lena C. VanBibber. "An exploratory study of specific classroom difficulties in the teaching of history and other social studies." National Council for the Social Studies, *Second Yearbook*, 7-54.

pronounced in the social studies than in impersonal subjects like mathematics and science. In fact, most of the material, since it deals with human beings and their activities, is provocative of reactions. The pupil is likely to despise the Assyrians, love the Greeks, admire the Romans, condemn the Barbarians, side with William the Conqueror (or Harold), hate the Loyalists, pity the Confederates, and suspect the Communists. Similar attitudes will develop toward individuals. And most pupils will have pronounced reactions toward all races, creeds, and groups. These reactions illustrate both the dangers and the opportunities of the social-studies teacher. The development of premature attitudes of opposition and loyalty militate against further growth. By closing the mind, strong feelings obscure the issues and tend to perpetuate initial attitudes. Thus the teacher sometimes encounters opposition in his teaching because the new materials seem to run counter to previously formed attitudes.

*k. Allegiances.* Attitudes may quickly harden into loyalties and allegiances. If the initial attitude was a worthy one, it leads to a worthy allegiance. Patriotism, loyalty, obedience, courage, and other desirable qualities are thus firmly fixed because they are attached to tangible moorings. The harm arises when these allegiances are felt toward economic classes, social cliques, racial groups, and narrow political entities. In such cases they tend to shut out more light and the pupil grows up with undesirable allegiances.

#### IV. REMEDIAL PROCEDURES IN THE SOCIAL STUDIES

In the previous section we considered some general and some special factors associated with unsatisfactory progress in the social studies. The remedial procedures suggested here will be limited largely to the special factors, since those pertaining to the general factors are discussed elsewhere in the Yearbook.

Faced with the problem of unsatisfactory progress, the teacher will want to envisage the whole diagnostic program. An objective is set up; a certain pupil is making unsatisfactory progress toward the objective; the probable cause, or at least a factor that could operate as a cause, is discovered; remedial work is undertaken. This section is devoted to suggestions that might be helpful in taking this last step.

A remedial program in the social studies may involve a variety of steps. Some of the more prominent ones are the following: training in reading for specific purposes; vocabulary exercises and drills; repetition and drill on materials; exercise to develop more systematic study

habits, practice in outlining; drill in the mechanics of writing; more careful selection of topics; elimination of unsuitable or redundant materials, an extensive reading program for capable students; simplification of difficult materials or substitution of easier matter; projects involving the reading, understanding, or construction of maps, tables, graphs, diagrams, time lines, pictures, and cartoons; special sections, classes, or groups; larger social participation, field trips, case studies of pupils and their environment; and a program of self-improvement for the teacher. Some of these will be treated in more detail.

### 1. Acquiring Experiences

Every teacher recognizes, and sometimes laments, the inexperience of his pupils. Time will bring many of the desired experiences, but it may bring some of them at a tremendous cost. Therefore, it seems desirable to expand the pupil's experience under direction, to take him on a personally conducted tour of as many new realms as possible. This expansion can be effected through projects and activities, both group and individual. A class that has prepared and served a luncheon has experienced the planning, purchasing, preparing, and serving of the food, and the accompanying social experiences of coöperating, of greeting guests, and of maintaining conversation. There is scarcely a limit to the number and variety of these activities so long as they have meaning for the child and significance for future development. Mere entertainment, supplying momentary needs, or activity for the sake of activity is not the purpose; the purpose is to provide experience that will facilitate learning. They will serve as direct methods of enlarging experience and furnish the elements out of which to build new experiences vicariously.

Having experiences, however, is but the first step in the learning process in the social studies. The others are identification of that experience by means of concepts, expansion of these concepts by seeing their application to variations of the original actuality, and the creation by the learner of the unexperienced, which he may do by rearranging elements from the experienced. All these steps are necessary. Without experience, the words used to designate actualities would have no meaning. The child must see a dog (or the symbol of a dog) before the identifying word has any significance for him. Without identifying words, the experience itself would lose its meaning. Without a realization of the inclusive nature of words, he would be unable to understand them when they are used by others. Having had experiences and

having learned words with which to identify the experiences, he is then able to rearrange them into new patterns; in other words, he is able to learn vicariously, or even subdititiously.

This fourth step in learning is of vital importance in education. If it were not possible, one's existence would be narrowed within the confines of actual experience. One does not have to shoot a lion in Africa in order to understand the act. If he has fired a gun, been in a dangerous situation, visioned strange surroundings — if, in short, he has had experiences that furnish contributing elements — he can put them together in a new pattern and have a reasonable understanding of the act of shooting a lion in Africa. One who has actually shot a lion might say that such vicarious learning was only a pale imitation of the actuality. However inadequate the vicarious learning may be, the point here is to stress its possibility. Were it not possible, there would be little use for schools; teachers would be limited to benevolent guidance of pupils as they acquired experiences (many of them on the adult level).

This brief summary of the learning process in the social studies indicates the enormous importance of words and ideas and enables us to see how they bear upon experience, identification, expansion of meanings, and vicarious learning. Consequently all these topics can be considered, for remedial purposes, as one related process involving words.

## 2. Growth of Vocabulary

Remedial work in vocabulary has received much attention. Word lists, both general and special, have been compiled. Textbooks have curtailed their vocabulary, defined difficult words, and provided word lists. Various devices for teaching words have been tried. Actual objects, pictures, definitions, and instances of their use have been utilized in attempts to give them vitality. Formal definitions, alone, have proved to be ineffective, for, paradoxical as it may sound, one cannot understand a definition until he knows at least one meaning of the word. This fact emphasizes the necessity of using new words before defining them.<sup>1</sup> The teacher will thus provide examples before practicing on definitions. The continued presence of objects, however, may deflect attention and hinder the development of the concept itself. Consequently the teacher will endeavor to make the word itself suffi-

<sup>1</sup> Mary G. Kelty, "The processes of learning history in middle childhood." *The Social Studies*, XXV, 26.

cient as soon as possible. It will thus become suffused with meaning and serve as the mnemonic for a chain of associations. The expansion of a word is accomplished by using it in a variety of settings. Its various connotations will thus be grasped, and it will appear as a rich, colorful, and elastic generalization.

While the teacher is thus enlarging the experiences of the pupil and helping him to identify its elements, the pupil may engage in various kinds of vicarious or succedaneous learning. The writer has tried the experiment of telling his class about an experience that was alien to its members, for example, a trip into a coal mine, and following the account by questions as to the origin of the elements they substituted for those which appeared in the story. One pupil said that he got the "darkness" for the mine out of a closet; another said he reduced an ordinary mule to fit the "little donkey" of the story; another transferred the hesitation with which he once sat down in a dusty chair to the act of sitting down in the soot-filled car of the story. Perhaps these illustrations show the process of vicarious or succedaneous learning and demonstrate the necessity of both original experience and the reconstruction of it into new combinations. The teacher will warn pupils against the idea that transfers of that sort equal original experiences; vicarious learning may give a false sense of understanding and lead to actual misunderstanding unless the pupil observes rigidly the restrictions laid upon him by the writer or speaker.

### 3. Developing Skills

Poorly developed skills as a factor in unsatisfactory work have already been mentioned. Boyington<sup>1</sup> has made a careful survey of the ability of students to use study tools and study techniques. They were tested on their ability to use various parts of a book, on their knowledge of reference books, on their understanding of the vocabulary of questioning, and on simple problems of criticism and evaluation. She concluded that even prospective teachers had inexact and vague notions of some of these skills. Teachers will find that time spent in developing skill in the use of the various parts of a book will facilitate all subsequent work.<sup>2</sup> Some teachers find it worth while to take their

<sup>1</sup> Gladys Boyington. "Experiments with diagnostic tests to determine knowledge of study tools and techniques in the social studies." In National Council for the Social Studies, *Second Yearbook*, 1932, 132-163.

<sup>2</sup> Chester Newlun. *Teaching Children to Summarize in Fifth-Grade History* (Teachers College Contributions to Education, No. 404). (*Note continued p. 328*)

classes into the library and demonstrate the use of the file, how to find an item in an encyclopedia, and how to find three articles on a given topic. The ease with which these somewhat mechanical skills can be taught and learned renders continued clumsiness inexcusable.

The development of skill in understanding materials<sup>1</sup> is not quite so simple. It involves reading for various purposes. The teacher who can rise above self-consciousness can give a valuable demonstration lesson in this art. Let her take the book and, reading and talking aloud, proceed to scan the assignment, read it more carefully, underscore significant points, reread involved sentences, debate with the author, comment on various passages, interpret pictures and other illustrative materials, recall associated materials, and give in every detail a demonstration of what is involved in reading and study. Let this be followed by a coöperative study of another lesson. Assignments involving careful reading and the interpretation of illustrative data also tend to develop skill in studying. The study-guide sections of some workbooks are calculated to promote intelligent and critical reading. No remedial procedure will effect sudden transformations, but careful guidance and persistent effort will overcome some of the more tangible difficulties.

The assembling of data into written form is also a difficult art, involving information of materials, logical sense, artistic taste, and mastery of the mechanics of writing. In view of the vast and continued efforts that teachers have directed toward this problem, no one formula would seem to offer much encouragement. The writer has most faith in teacher participation and guidance. Call for no written reports until two or three have been developed carefully and fully by the coöperative process; then criticize kindly but unsparingly the first independent efforts. If necessary, rewrite some of the most promising ones. If mastery of even some elements involved in a correct synthesis is achieved in one year, the teacher has cause to congratulate herself.

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William A. Barton. *Outlining as a Study Procedure* (Teachers College Contributions to Education, No. 411).

<sup>1</sup> A number of tests designed to measure the mature results of effort in the social studies are available, such as A. S. Barr, *Diagnostic Test in American History* (Bloomington: Public School Pub. Co., 1920); M. J. Van Wagner, *Unit Scales 4 Attainment in History and Geography* (Minneapolis: Educational Test Bureau, 1933); Edgar B. Wesley, *Wesley Test in Social Terms* (New York: Scribner's, 1932).

#### 4. Developing a Sense of Time

The development of a time sense is a fairly tangible process. It involves a realization of the sequence of events, of time extension, and of mathematical measuring units. Studies have shown that a sense of time develops gradually, reaching something like its full fruition about the age of fourteen. It is well established that the vocabulary of time is a necessary element in this growth. Equally well established is the point that approximate dates have little or no significance until they are related to specific ones. So the teacher who makes liberal use of time lines and other devices, who stresses the vocabulary containing such words as 'before,' 'after,' 'hour,' 'afternoon,' 'month,' 'minute,' 'half-hour,' 'week,' 'year,' 'score,' 'century,' etc., and who drills upon a few specific dates is following the results of the most approved research. Helpful also is the practice of having pupils learn the age of the oldest person they know and thus try to extend their concept of sixty or seventy-five years into a sort of personal reality. Accuracy and specificity in time concepts will come only with age, practice, and the development of the arithmetical basis of dates.

#### 5. Developing a Sense of Place

The development of place sense offers another tangible problem. The elementary requirements seem to be a sense of direction, distance, and area. Directions are frequently based upon local features and so fail to function when the pupil is removed from his neighborhood. This indicates the need of basing directions upon permanent and observable features, such as the sun and stars. A sense of distance seems dependent upon travel and upon the frequent use of scales in connection with maps. The learning of the specific areas of a few states or countries and utilizing them as a basis for comparison seems to be the most feasible scheme for building up a sense of geographic size.

Growth in place sense is dependent upon skill in using maps; consequently the teacher can scarcely overemphasize direction, scale of miles, the index to maps, the significance of colors, and all the details of maps and globes. The abilities to read road maps, railroad time-tables, weather maps, distance charts, and varied data relating to location and space constitute accomplishments of intrinsic value and facilitate the development of a sense of place.

### 6. Securing Better Materials

Unsuitable and inadequate material offers a constant challenge to teachers. No systematic and inclusive study of grade placement in the social studies has been made. In fact, the problem of individual differences and the lack of gradation in the ideas themselves would seem to minimize or nullify whatever results might be obtained by such a study. Consequently, teachers must rely upon word lists, such limited studies as have been made, and experience. In the absence of scientific studies that would justify the placement of materials, the teacher would seem to be justified in eliminating topics that appear to be too difficult and in concentrating upon those that are more manageable.

Experiments in simplifying materials by substituting synonyms do not offer much encouragement to pursue that course; so the teacher must, if forced to use too difficult material, rewrite or restate whole passages. Fortunately, the variety of texts and supplementary books enables teachers to make reasonably satisfactory selections.

The problem of securing adequate materials has become more acute in recent years. The discouraging situation, however, should not result in minimizing efforts to secure at least some of the current material in the form of pamphlets and periodicals as well as books. Much of it is inexpensive, and some of it is indispensable for a successful program in the social studies.

### 7. Attitudes and Allegiances

No very tangible program exists for inculcating those personal qualities which we have classified as social sense, attitudes, allegiances, and leadership. It is certain that they do not rest upon information; it is equally certain that they do not exist without it. Direct attempts to teach these qualities have met with little apparent success; indirect attempts often seem to meet no better success. Racial prejudices, national hostilities, social envies, class struggles, and individual acquisitiveness demonstrate the need of restoring the moral purpose to the social studies. Perhaps the *Report* of the Commission of the American Historical Association will assist in effecting the return of ethical and moral purposes to the social studies.

## CHAPTER XVI

### DIAGNOSIS AND REMEDIAL TREATMENT IN THE FIELD OF SCIENCE

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#### I. THE OBJECTIVES OF SCIENCE TEACHING

One of the most significant recent developments in the field of the teaching of science has been the refining and defining of major objectives. Departing from earlier precedents, the Society's Committee on the Teaching of Science<sup>1</sup> announced only two great objectives of all courses in science at the elementary and secondary levels: (1) to give a functional understanding of major generalizations or principles, and (2) to inculcate scientific attitudes. Subject matter, which is of course admitted to be essential as the basis of every course in science at every level, is considered by this Committee not as an end in itself but as a means to more important ends. This point of view finds support in the results of investigations<sup>2</sup> indicating that accurate knowledge of scientific facts is soon lost.

As would be expected, however, such diagnosis and remedial treatment as have been effected in the field of the teaching of science to date have been confined almost exclusively to the knowledge of subject matter. The reason is obvious. Diagnosis and remedial treatment in any field depend on the extent to which the achievement of desired outcomes can be measured.

Little has yet been accomplished in the devising of tests to measure other goals of science training, perhaps owing primarily to the fact that the goals themselves are more or less nebulous. There is as yet no generally accepted definition of either scientific attitudes or of scientific principles, or generalizations. Hence a discussion of diagnosis in these aspects of science teaching must consist chiefly of reports of progress, and suggestions for remedial treatment must be largely tentative.

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<sup>1</sup> *Thirty-First Yearbook of this Society, Part I, 1932.*

<sup>2</sup> Francis D. Curtis. *Investigations in the Teaching of Science, I and II* (Philadelphia: P. Blakiston's Son and Company, 1926 and 1931). See Studies by Powers and Miller, Nos. 42C and 126.

## II. ACHIEVEMENT IN SUBJECT MATTER

Numerous achievement tests termed diagnostic have appeared in the various fields of science during the past decade. The purpose of a considerable number of these tests is to ascertain, at the beginning of a course or of a unit, whether or not the pupil already possesses a sufficient mastery of the content to justify his pursuing the study of part or all of it further. If a factual knowledge of science were the only goal, or even the most important goal, of the course, the use of such diagnostic tests would deserve to command more attention. But the practice of excusing a pupil from the further study of a unit on the basis of scores, however high, on any test of subject matter is open to grave criticism. Even those tests that include as 'achievement' not merely the knowledge of facts but also the ability to reason from such facts do not reveal the extent to which the pupil may then possess those more important outcomes of the course — knowledge of principles and scientific attitudes.

The following are typical achievement-test items that test mere recall of facts:

6. Heat is a form of (1) matter; (2) inertia; (3) friction; (4) mass; (5) vacuum; (6) energy; (7) force; (8) power. \_\_\_\_\_ 6.
7. Sounds ordinarily travel through air at a rate of about (a) 183,000 miles per second; (b) 60 miles per hour; (c) 1 mile per minute; (d) 1100 feet per second; (e) 100 feet per second. \_\_\_\_\_ 7.

The following items mark an advance over the items just given, since these test not only possession of information but also ability to reason from the information:

16. Men working in a caisson 68 feet below the surface of a lake must endure a pressure of (a) 15; (b) 30; (c) 45; (d) 64; (e) 102; (f) 250 pounds per square inch. \_\_\_\_\_ 16.
17. An E.M.F. of 110 volts sends a current of 10 amperes through a circuit for ten hours. At \$10 per K.W.H., the bill will be (a) \$50; (b) \$.85; (c) \$1 10; (d) \$1.55; (e) \$4.52. \_\_\_\_\_ 17.
18. A lift pump would be more effective half way up a mountain than at the \_\_\_\_\_ of the mountain. \_\_\_\_\_ 18.

It is relatively easy to determine from the scores on tests of the first sort whether the learning of facts has been sufficiently complete and extensive to satisfy the demands of the course. If the results in such tests are unsatisfactory, additional drill on the subject matter should raise the pupil's achievement to the level desired. Hurd<sup>1</sup> has demonstrated the effectiveness of such diagnosis and remedial treatment. In a summary of results of a number of investigations he concludes: "Definite remedial instruction based upon analysis of errors greatly increases pupil achievement scores."

If achievement tests of the second sort indicate that the pupil is unable to use scientific facts in the solution of problems, the remedial treatment may consist of further drill upon the fundamental facts themselves, followed by extensive practice in solving problems based upon these facts. It is perhaps not too broad a statement to say that, unless a pupil demonstrates some ability to apply scientific facts to the solution of 'practical' problems involving these facts, he has really not 'achieved' at all, however encyclopedic his knowledge of facts may be.

### III. SCIENTIFIC ATTITUDES AND SCIENTIFIC METHODS

The importance of effective training in scientific attitudes for everybody is paramount. Such training is the only means by which the average citizen may be equipped to evaluate the claims of advertisers in various fields; to combat the almost universal slavery to superstition; to weigh propaganda on questions of religion, economics, and sociology; and to substitute reasoned response for immediate, unconsidered impulse in innumerable situations in everyday life. Contrary to some recently voiced opinion, adequate training in scientific attitudes can be provided far better in natural-science than in social-science courses, both because the scientific attitudes are more closely related to the subject matter of science and also because teachers trained in habits of scientific thinking are more competent to train pupils in these same habits.

Although at present probably no problem in the field of the teaching of science is receiving more attention than that of teaching and measuring scientific attitudes, yet the first list of these attitudes was

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<sup>1</sup> Archer Willis Hurd, *Coöperative Experimentation in Materials and Methods in Secondary Schools* (New York: Bureau of Publications, Teachers College, 1933), pp. 4-5.

published as recently as 1924. This list,<sup>1</sup> secured from an analysis of literature dealing with philosophical phases of scientific thought, follows:

#### The Scientific Attitudes

- I. Conviction of universal, basic cause-and-effect relations, rendering untenable
  - a. Superstitious beliefs in general, as 'signs' of 'good luck' or 'bad luck,' and charms;
  - b. 'Unexplainable mysteries';
  - c. 'Beats all' attitude, commonly revealed by
    1. Too ready credulity;
    2. Tendency to magnify the importance of coincidence
- II. Sensitive curiosity concerning reasons for happenings, coupled with ideals
  - a. Of careful and accurate observation or of equally careful and accurate use of pertinent data previously collected by others;
  - b. Of patient collecting of data;
  - c. Of persistence in the search for adequate explanation.
- III. Habit of delayed response, holding views tentatively for suitable reflection (varying with the matter in hand)
  - a. To permit adequate consideration of possible options;
  - b. To permit a conscious plan of attack, clearly looking forward to a prediction of the probable outcome or solution.
- IV. Habit of weighing evidence with respect to its
  - a. Pertinence;
  - b. Soundness;
  - c. Adequacy.
- V Respect for another's point of view, an open-mindedness, and willingness to be convinced by evidence.

Later Craig<sup>2</sup> extended and improved the original list by adding:

1. Man's conception of truth changes.
2. Orderliness prevails in nature Effects result from causes.
3. Attainments in science have bred confidence in the scientific methods.
4. Much knowledge remains to be revealed.

<sup>1</sup> Francis D. Curtis. *Some Values Derived from Extensive Reading of General Science* (New York: Teachers College, Columbia University Bureau of Publications, 1924), pp. 41-49.

<sup>2</sup> Gerald S. Craig. *Certain Techniques Used in Developing a Course of Study in Science for the Horace Mann Elementary School* (New York: Teachers College, Columbia University, 1927).

In 1933, Noll<sup>1</sup> listed these "habits of scientific thinking":

1. Habit of accuracy in all operations, including calculation, observation, and report
2. Habit of intellectual honesty
3. Habit of open-mindedness
4. Habit of suspended judgment
5. Habit of looking for true cause-and-effect relationships
6. Habit of criticism, including self-criticism

A report of a study of scientific attitudes by the State Science Committee of Wisconsin, under the leadership of Professor Ira C. Davis,<sup>2</sup> lists these five statements as characteristic scientific attitudes selected from an extensive list by seventy-five percent of ninety-two selected teachers of science.

An individual who has a scientific attitude

1. Will show a willingness to change his opinion on the basis of new evidence;
2. Will search for the whole truth, regardless of personal, religious, or social prejudice;
3. Will have a concept of cause-and-effect relationships;
4. Will make a habit of basing judgment on fact;
5. Will have the power to distinguish between fact and theory.

Although no two of these lists of scientific attitudes agree exactly, it will be noted that there is a considerable degree of uniformity of ideas with respect to what some at least of the desirable scientific attitudes are. For the present, therefore, and until such time as a generally accepted list of scientific attitudes may be available, it may be well to accept one of these lists and to supplement it with additional points from other lists of scientific attitudes. The next step is to simplify the wording of these scientific attitudes, so that pupils will readily comprehend them. One such attempt at simplification includes items like the following:

*Attitude*

*Simplification for Pupil's Comprehension*

- |   |  |
|---|--|
| 1. Conviction of universal cause-and-effect relations | 1. A scientist believes that nothing can happen without a cause. |
|---|--|

<sup>1</sup> Victor H. Noll. "Habits of scientific thinking." *Teachers College Record*, 35: October, 1933, 1-9.

<sup>2</sup> George J. Skewes, "What is a scientific attitude?" *The Wisconsin Journal of Education*, 66: December, 1933, 160-162.

<i>Attitude</i>	<i>Simplification for Pupil's Comprehension</i>
2. Man's conception of truth changes	2. A scientist believes that truth never changes, but that our ideas of what is true change as we gain more and more knowledge
3 Respect for another's point of view, an open-mindedness and willingness to be convinced by evidence	3. A scientist respects another's point of view He is willing to be convinced by evidence In other words he would say, "I may be wrong in my beliefs, opinions, or conclusions. I will not change these without convincing evidence, but I shall always be willing to change if somebody shows me that I am wrong."
4. Habit of weighing evidence with respect to its adequacy	4. A scientist never bases final conclusions upon one or a few observations.

The third step is to give classroom training in scientific attitudes. Curtis,<sup>1</sup> experimenting with groups of eighth-grade pupils in New York City, devoted a small portion of the total class time to discussions of "newspaper clippings containing false deductions, problems with insufficient or superfluous data, discussions of superstitions, uncompleted demonstrations of experiments permitting prediction of possible solutions, and reports upon inventors and other scientists who were forced to struggle for their success against prejudice and narrow-mindedness . . ." He concluded that a little instruction of this type in the scientific attitudes is of great value and that direct definite training toward this end is more productive of desired results than the ordinary classroom activities or the extensive reading of scientific literature.

The fourth step is to construct tests to measure the pupil's possession of the various scientific attitudes. One type of test of scientific attitudes is illustrated by the following sample:

*Directions.* Each of the items which follow illustrates the possession or the lack of one or more of the scientific attitudes which are on the accompanying numbered list of scientific attitudes. Write in the blank<sup>2</sup> following each item the number or the numbers of the listed scientific attitudes which are illustrated by the item.

<sup>1</sup> *Loc. cit.*, p. 54.

<sup>2</sup> Not here shown.

1. William Beebe has spent many years in the tireless search for facts and more facts, checking and rechecking his observations of the plants and animals of jungle and ocean.

2. "One pupil insisted that grasshoppers are green, while another was just as positive that they are brown. Each stated that he had only that morning seen a grasshopper of the color he described"

Another type of test employs such materials as these:

*Directions:* Each of the following items is followed by five or six statements. Two of these statements in each case indicate some degree of desirable scientific attitudes. Write in the blank<sup>1</sup> following each, the letters representing these endings, placing the best one first and the next best second.

1 In the Sunday supplement of our newspaper was the account of a living chicken with two heads, one of a hen and the other of a rooster. (a) The account may be true, but is difficult to believe. (b) The account is certainly true. (c) I will not believe the account until I see the chicken. (d) The account is absurd. (e) I'll never believe anything I read in a Sunday supplement (f) Before I accept the account as true, I shall want to see it in some scientific paper of recognized authority.

2. Two scientists of equal reputation and eminence have recently announced exactly opposite conclusions regarding the relations of certain fossils to present-day animals (a) More evidence is needed to determine which is correct. (b) What difference does it make which is right? (c) Both may be right. (d) They are probably both wrong. (e) The one who announced his conclusions first is probably right; the other is merely arguing. (f) The problem may be of such a nature that both may be partly right.

A word of caution is in order with respect to the interpretation of the scores on such test items. Pupils become adept at sensing what the accepted, or 'respectable,' attitude toward a certain type of situation is and thus respond correctly to items involving these situations. But their ability to do so may not be even an indication of how they would react when confronted with real situations like the following:

Recently in a high-school science classroom, the teacher asked the pupils whether any of them considered it "unlucky" to break a mirror. All disclaimed possessing such a superstition and many of them scoffed at the idea that any sensible person should be so superstitious. But when the teacher produced a mirror and asked who would be willing to break it, nobody in the class was willing to volunteer. The teacher commented upon the inconsistency between their

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<sup>1</sup> Not here shown.

professed attitude and their refusal to act in accordance with it. Most of the class grinned sheepishly, yet nobody would break the mirror. The teacher then himself broke the mirror.

Nobody has devised any method of measuring with a classroom test the extent to which attitudes are really ingrained so as to function in daily conduct. Such a measure could perhaps be based only upon the observation of the individual in all his activities over a long period.

Work of outstanding value involving diagnosis and remedial treatment with respect to certain of the scientific attitudes has been published under the designation of studies of superstitions and other "unfounded beliefs." In a typical study of this sort by Lundeen and Caldwell<sup>1</sup> the investigators secured abundant data substantiating the conclusion that carefully planned instruction is effective in reducing the prevalence of unfounded beliefs. Their method consisted of supplementing the regular textbook assignments of a class with supplementary discussions so constructed as to show the absurdity of some specific unfounded belief or to emphasize some desirable scientific attitude, the possession of which renders the retention of the unfounded belief impossible.

The State Science Committee of Wisconsin has prepared tests of certain of the scientific attitudes in mimeographed experimental form. Doubtless these tests will be issued in printed form before this article appears. The Fact-Theory Test of 103 statements is preceded by these directions:

Below are listed a number of statements.

- A. Some of these statements are well-established facts which are always true.
- B. Some are statements or well-established theories which are generally accepted.
- C. Some are statements of theories which are questioned by some authorities.
- D. Some are statements of popular beliefs which are not supported by evidence.

Classify each statement by checking in the column A, B, C, D, under which it should be classified. If you are not familiar enough with a statement to classify it, place a check mark in column E.

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<sup>1</sup> Gerhard E. Lundeen and Otis W. Caldwell. "A study of unfounded beliefs among high-school seniors." *Journal of Educational Research*, 12: November, 1930, 257-273.

There follow items like these:

- A disease is a punishment for some particular moral wrong.
- The pressure of water varies with the depth.
- All children who are large and strong for their age are poor in their school work
- Heating the molecules in air increases their speed.

The test of Cause-and-Effect Relationships of 66 items is preceded by these directions:

Below are listed a number of pairs of occurrences.

- A. Sometimes the first is practically the sole cause of the second.
- B. Sometimes the first is one of a number of necessary contributing causes of the second.
- C. Sometimes the first contributes only slightly to the second.
- D. Sometimes both are the results of the same general cause or causes.
- E. Sometimes the first bears no causal relationship to the second

Classify each pair of occurrences by checking in the column A, B, C, D, E, under which it should be classified.

Typical items that follow in this test are:

- The branches of a tree wave to and fro; a nearby windmill turns.
- Heat of sunlight; warmth on earth.
- The ignition switch of a car was turned off; the engine stopped running.
- A woman dropped a dish on the floor; the dish broke.
- A fruit can was opened; the fruit in the can spoiled.

The close relation between scientific methods and scientific attitudes is revealed in work by Downing.<sup>1</sup> It is certain that the two are inseparable — that scientific attitudes are essential in the employment of scientific methods and that the employment of scientific methods contributes training in scientific attitudes. Scientific methods, as distinct from scientific attitudes, probably include the following, although it is obvious that all these points are not mutually exclusive:

1. Locating problems.
2. Making hypotheses, or generalizations, from given facts.
3. Recognizing errors and defects in conditions or experiments described.

<sup>1</sup> Elliot R. Downing. "Elements and safeguards of scientific thinking." *The Scientific Monthly*, 26; April, 1928, 231-242.

4. Evaluating data or procedures
5. Evaluating conclusions in the light of the facts or observations upon which they are based.
6. Planning and making new observations to find out whether certain conclusions are sound.
7. Making inferences from facts and observations.
8. Inventing check experiments.
9. Using controls
10. Isolating the experimental factor

Exercises of several kinds have been found effective in teaching scientific methods. Such exercises include experiments set up with controls<sup>1</sup> and incidents from the history of science accompanied by questions directing attention to applications of scientific methods.

The diagnosis of the extent to which the pupil has gained a knowledge of the scientific methods can be made with several types of test items. He can be asked to set up experiments in which he provides controls and check experiments, and in which he locates and isolates the experimental factor; he can be given data upon which to draw inferences and make hypotheses.

Downing's test of "Some Elements of Scientific Thinking"<sup>2</sup> contains items testing accuracy of observation, ability to pick out pertinent elements from a complex situation, selective recall, ability to synthesize, fertility of hypothesis, ability to define a problem, ability to hold in mind a complex of relations, ability to solve problems, judgment on adequacy of data, suspended judgment, ability to apply a rule, ability to test an hypothesis, awareness of the danger of reasoning by analogy, and ability to arrange data in sequence to make the conclusion evident.

Tyler<sup>3</sup> and his associates at Ohio State University have evolved a series of tests of various scientific methods. Typical items (omitting spaces for replies) are these:

*Directions:* In each of the following exercises a problem is given. Below each problem are two lists of statements. The first list contains statements which can be used to answer the problem. On the

<sup>1</sup> A *control* in an experiment is anything in the experiment that gives a basis for comparison. Every factor in the control is exactly like that in the experiment itself except one. This one factor that is different is called the *experimental factor*.

<sup>2</sup> The University of Chicago, School of Education.

<sup>3</sup> R. W. Tyler, *Constructing Achievement Tests* (Columbus, Ohio: The Ohio State University, 1934).

blank line to the right of the statements, check only the statement or statements which answer the problem. The second list contains statements which can be used to explain the right answers. On the blank line to the right of the statements, check only the statement or statements which *give the reasons for the right answers*. Some of the other statements are true but do not explain the right answers; *do not check these*. In doing these exercises, then, you are to check only the statements which answer the problem and which *give the reasons for the RIGHT answers*.

Twenty fertilized hens' eggs were divided in two groups of ten eggs each. The one group of ten eggs was kept at 100 degrees F. for three weeks. The second group of ten eggs was kept at 40 degrees for three weeks. Air and moisture conditions of the surroundings of both groups were suitable for hatching. What will be the result at the end of three weeks and why?

- a. The eggs kept at 100 degrees F. will hatch
- b. The eggs kept at 40 degrees F. will hatch
- c. The eggs kept at 40 degrees F. will not hatch.
- d. The eggs kept at 100 degrees F. will not hatch.

Check the following statements which give the reasons for the answer or answers you have checked above.

- e. Hens' eggs will not hatch at temperatures as low as 40 degrees F.
- f. The hatching of hens' eggs depends to some extent on the moisture conditions of the surrounding air.
- g. A temperature of 100 degrees F. is too high for hens' eggs to hatch.
- h. Temperature is related to the hatching of hens' eggs.
- i. Temperatures of 100 degrees F. are suitable for the hatching of hens' eggs.
- j. Hens' eggs will hatch at a temperature of 40 degrees F.

Another type of test of scientific methods lists certain of the scientific methods given previously in this chapter. A blank is left after each. A description of the activities of some scientist while engaged in an important investigation is given. Each sentence of the description is numbered. The student is asked to write in the blanks following the scientific methods the numbers of the sentences that illustrate these respective methods.

A third type of test is designed to measure the pupil's mastery of phases of scientific method, such as controls, check experiments, etc. These various tests reveal dependably whether a pupil does or does

not possess an *understanding* of scientific methods and an ability to apply them in actual situations. The mastery of scientific methods seems, as might be anticipated, to have a high correlation with general intelligence; superior pupils are able to master scientific methods and to apply them to problems introduced into the classroom, whereas less intelligent pupils experience the same difficulties with scientific methods that they encounter in the pursuit of other intellectual tasks. Of course, as with the scientific attitudes, the real test of the effectiveness of training in scientific method cannot be determined with classroom situations or classroom tests, but only by the reactions of learners in out-of-school and post-school situations.

#### IV. CERTAIN LABORATORY TECHNIQUES AND SKILLS

Since laboratory skills and techniques are inseparable from scientific methods, and since individual experimentation by pupils is deemed by most authorities to be an indispensable part of the training afforded by science courses, especially at the senior-high-school level, investigations aiming at a standardization of certain laboratory techniques and skills are significant to our discussion. Horton<sup>1</sup> analyzed fifteen chemistry manuals to discover what manipulative skills and habits students should acquire in the course of a year's work in chemistry. Fifty-five of these skills and habits were deemed important by a selected list of teachers of chemistry.

Tyler<sup>2</sup> analyzed the difficulties of students in the use of the compound microscope. From this analysis he determined the basic skills and habits essential to the successful use of this instrument. Further refinement of this checking list resulted in a group test and an individual test of skill in using the microscope that deserve wide use.

The effective classroom use of both the Horton and the Tyler lists consists first in using them as materials for instructing the pupils in correct techniques. In the introductory training period the teacher demonstrates the correct practices included in the list, calling attention to various dangers, safeguards, and the like. Then the pupils under the instructor's vigilant direction perform the various manipula-

<sup>1</sup> Ralph E. Horton, *Measurable Outcomes of Individual Laboratory Work in High School Chemistry* (New York: Bureau of Publications, Teachers College, 1928), pp. 49-50.

<sup>2</sup> R. W. Tyler, *Constructing Achievement Tests* (Columbus, Ohio: The Ohio State University, 1934).

tions until able to execute them correctly and skillfully. Further vigilant supervision is necessary during the chemistry course to insure that there is continuous progress toward the establishment of correct laboratory habits and to prevent a relapse into careless habits. Thus the laboratory list serves as a constant means of diagnosis and remedial suggestions.

Diagnostic and remedial treatment with the microscope test is effected in this way: following the period of instruction in the use of the microscope, the group test is given to the entire class twice with an interval of three days between administrations of the test. Those who in the two tests are unable to find an object on a slide in three minutes are given the individual test "which permits the instructor to determine the type of remedial training needed and to give that training with a minimum expenditure of time and effort."

#### V. SCIENTIFIC PRINCIPLES

There are numerous mentions of scientific principles in the literature, but one searches almost in vain for a clear-cut statement of the author's idea of what a principle is. This lack of accord on the definition of 'principal' is reflected in instructional materials of all sorts, an increasing proportion of which purport to give training in scientific principles, but do not make clear the distinction between principles, facts, postulates, inferences, and hypotheses. The same sort of confusion is reflected in the tests designed to measure the pupil's grasp of scientific principles. In some of these tests it is difficult to distinguish any obvious difference between items intended to measure mastery of principles and items intended to measure simple knowledge of facts.

A growing tendency is noted to define a scientific principle as 'a generalization of observed facts.' The greater the scope of factual information generalized in the statement of a principle, the more nearly this principle approaches the dignity of a 'major generalization.' Downing, Craig, and Robertson have probably made the most substantial contributions toward defining and listing scientific principles. The teaching of such principles is commonly effected by a process of induction from facts and observations.

Diagnosis of *understanding* of scientific principles that satisfy this definition is practicable by several methods. Pupils may be given statements of principles and asked to supply facts that substantiate them. For example:

Write in the space below each of the following principles, facts which support these principles:

1. The world is very old.

The pupils write such facts as these:

Fossils have been found of animals which lived ages before man was on earth.

Coal was formed from plants which lived millions of years ago.

Millions of years must have been required in wearing down the Grand Canyon or the Appalachian Mountains.

Another diagnostic test of *understanding* of principles consists of a modification of the matching technique. In the first of two parallel columns is given a list of principles developed in a unit or in the course; in the second column are statements that illustrate or pertain to the principles in the first column. The pupils are asked to indicate the principle or principles that each statement matches. For example:

*A*

1. The plants and animals in a given region depend on one another.

2. All living things have enemies which compete with them for available energy.

3. In general the greater the degree of parental care, the smaller the number of offspring.

[*and so forth*]

*B*

"The kingfisher rose from the creek with a good-sized trout in its beak."

"We could not help contrasting the behavior of the bullfrogs which did their best to capture their numerous offspring with that of the male Chinese pheasant which we had just seen proudly supervising and guarding his lusty brood."

[*and so forth*]

Attention should again be called to the fact that such tests as those just described measure *comprehension* of the meaning of principles; they do not measure the *functional* understanding of principles, which is an accepted major objective of science teaching. As with scientific attitudes and scientific methods, there can be no way of measuring the extent to which any of these important goals has actually become a part of the pupil; such outcomes can only be measured by following the pupil through life and noting the extent to which he reacts in terms of these accepted aims of science teaching.

To illustrate, a pupil might be able to recite glibly voluminous evidence tending to substantiate a principle or to match the statement of the principle with some statement relating to it, yet not apply this principle later when his safety or advantage might demand it. He might, for instance, understand the biological principle of protective coloration and yet serenely enter the woods on a hunting expedition clothed in garments that would render him indistinguishable as a human being to other hunters on the eager search for animals closely resembling their habitat. Or he might clearly understand the principle of the flow of electric current from points of higher to points of lower E.M.F without being able to apply this knowledge in the manner described by Downing as a means of determining the depth necessary to dig a well.

While science teachers can never be assured that they have actually achieved any of these important aims of science teaching, because the aims must be furthered and tested in school but function out of school, nevertheless the various tests cited will reveal with considerable fidelity the extent to which pupils have gained an understanding of scientific attitudes, scientific methods, and scientific principles. Such diagnosis should be followed by abundant and widely varying exposition, illustration, and practice in each of the separate phases of these aims, until subsequent tests reveal a satisfactory degree of pupil understanding.

## *SECTION IV*

### **DIAGNOSIS AND REMEDIAL TREATMENT RELATED TO OTHER OBJECTIVES OF INSTRUCTION**

Section III dealt with the techniques of diagnosis and remedial instruction in reading, English, arithmetic, social studies, and science.

In Section IV attention is given to the techniques of diagnosis and remedial treatment in less specific fields of instruction the outcomes of which are not so readily classified as skills, abilities, and habits.

The Section comprises eight chapters that treat of health, behavior disorders, speech, music, art, vocational aptitude and interests, use of leisure time, and creativeness. It can readily be seen that these chapters deal with less specific outcomes than those that are treated in Section III. The importance of these chapters arises out of the fact that they concern outcomes of instruction that have been specially emphasized by modern educational practices. It is hoped that the techniques described in the Section may present bases for evaluating progress being made by any type of school in achieving desired educational objectives. Each chapter is a complete unit, organized under the general headings given for each chapter in Section III. The material serves as a means of focussing attention on the importance of physical, social, environmental, and emotional factors associated with learning difficulty that were discussed in detail in Section I.

## CHAPTER XVII

### DIAGNOSIS IN HEALTH EDUCATION

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#### I. THE DEVELOPMENT OF HEALTH EDUCATION

As conditions change or as new ends are sought, there must be alterations in the health-education program and its teaching techniques and devices. Any health program in a school or a community must be developmental and never static if it is to meet these requirements. The techniques of a previous day cannot achieve present-day needs.

At their inception, school health programs started with the control of environmental factors, like fire hazard and ventilation. Gradually more complex social problems were undertaken, problems that partook of the personal. Individual resistance to disease was involved as well as the hazards incident to an impure water or food supply. Next the school health authorities made a concerted attack on the physical defects of children, faulty eating and sleeping habits, on personal hygiene in its most intimate phases.

These were not problems of environment, yet no one rightfully questioned the value or the need of entering this field of health promotion. Physical defects of children had to be corrected; individual resistance to certain communicable diseases had to be improved; healthy, efficient personal hygiene had to be practiced. The forces of the school were brought into play to accomplish all this. But, the technique used in furthering these ends was very largely that of 'purchase' so successfully employed in the improvement of environmental health factors. Boards of education appropriated money to put buildings in sanitary condition. Water supplies, waste disposal, lighting and ventilation systems were all that could be suggested by the combined knowledge of sanitarians and physicians — knowledge bought and paid for to improve the health of the school child and the entire community, with benefit to all.

With the enlargement of health promotion to include the more personal phase, the same device was utilized. The school authorities bought such things as vaccination against smallpox, immunization

against diphtheria, physical examination, correction of physical defects. Food was given to the hungry; baths, to the unwashed. Teeth were filled, cleaned, and extracted. In short, the school authorities did all they could to supply the health needs of the school children by buying material, service, and skill. Children and their families were led to turn to the state for their medical council and service. This sort of service was available to the child only as long as he remained in school. It was withdrawn as soon as the child left school and as a rule did not function satisfactorily before he entered school.

This had an undesirable effect in that it caused parents to postpone needed and advisable medical care until the child reached school age. The child was turned out to take his place in society not yet having learned where to turn for a reliable, uninterrupted source of medical advice and care. After school there was no one to give him free medical attention.

## II. THE AIMS AND OBJECTIVES OF HEALTH EDUCATION

It may be safely assumed that in the majority of cases the continuation of a physical defect or the persistence of a faulty health habit of a school child represents to a large extent the manifestation of a deeper underlying fault of education. The child and his family unit do not know certain essentials about health. Either they do not know what constitutes good health, or knowing this, they do not know why or how to utilize the medical facilities of the community to obtain the needed remedial care.

The first aim then to be set up should be the establishment of certain standards of health. As recently as fifteen years ago it was the accepted thing for an adolescent girl living in certain parts of this country to have a goiter. Approximately one-third of all the high-school boys and girls of Detroit, Cleveland, and cities of the Great Lakes area showed definitely enlarged thyroid glands. Today we know this to be an abnormality. By reason of changed dietary habits, this condition is a rarity and has been reduced to less than a fraction of one percent in certain of the Great Lake cities. A new standard of health had to be established. Numerous similar instances could be cited; e.g., myopia and hookworm.

Once there has been shown that a defect of health exists, the second aim of health education must be to teach what can be done in the way of remedial action. The science of curative and preventive medicine is so young that it is not fully appreciated by the masses. There

has not as yet been developed an appreciation of the true and the false in healing cults. Many families look upon all communicable diseases as the necessary accompaniment of childhood. Sickness and ill health, disease and suffering, are taken as a matter of human lot by too many people.

The aims of health education have been variously expressed. The statement in the "Report of the Joint Committee on Health Problems in Education" is, in part: "(1) To instruct children and youth so that they may conserve and improve their own health; (2) to establish in them the habits and principles of living which throughout their school life, and into later years, will assure abundant vigor and vitality . . . ; (3) to influence parents and other adults through the health-education program for children to better habits and attitudes . . . ; (4) to improve the individual and the community life of the future; to insure a better second generation, and a still better third generation; a healthier and fitter nation and race."

### III. HEALTH INSPECTION BY THE TEACHER

It is the duty of the teacher to acquaint herself with the child and his physical make-up. This cannot be done in any better manner than by having the teacher herself look at each child and study him as an individual.

Health inspection is ordinarily divided into two parts: first, inspection for evidences of communicable diseases; second, inspection for physical defects. These inspections are simple in nature and contribute to establishing in the minds of the children and parents a better idea of what constitutes good health.

#### 1. Inspection for Communicable Disease

Inspection for the presence of communicable disease is frequently referred to as 'morning inspection.' It is at this time that each teacher should take stock of the children under her care. There is a dual responsibility placed upon her: first, there is that of preventing damage to the sick child by not allowing him to take part in work when he should not; second, there is the responsibility to the other children of the class in protecting them from needless exposure to a possible communicable disease.

The teacher does not have to be a diagnostician of communicable diseases in order to conduct the best possible morning inspection. She does not have to be able to establish a differential diagnosis between

measles and rubella (German measles), or between chickenpox and smallpox, or tonsillitis and scarlet fever. Her task is completed when the ill child has been detected and when proper machinery has been set in motion to care for him and also to correct the fault that allows a community or a family to send such an ill child to school.

## 2. Symptoms of Diseases

The signs and symptoms of many of the commoner communicable diseases are the same at their onset. No child should be allowed in school — indeed, should not be allowed to come to school — if he presents any of these.

*Sore throat* may be the first sign of scarlet fever, diphtheria, mumps, streptococcic sore throat, or simple tonsillitis. It may require laboratory and clinical tests to make the true diagnosis — but the point is that a child with this symptom does not belong in school.

*Vomiting* ushers in many of the acute illnesses. Frequently the child and his parents give a false history of the child having eaten something out of the ordinary, though only in the most unusual cases can food in itself cause vomiting. When a child comes to school with a history of having vomited, then that child is sick and should be sent home. This symptom frequently is the first accompanying the onset of a communicable disease.

*Rashes* are abnormalities, and children with such skin disturbances do not belong in school. It is not necessary to remove the clothing to see most of the disturbances of the skin that occur. They may be of almost any nature extending from a blush to raised, pus-filled nodules. There are usually other accompanying signs, such as itching, general illness, fever, vomiting, headache, dizziness.

The disposition of the case of *common cold* is debatable. In the first place it is exceedingly difficult to distinguish the cold that is due to a communicable condition from the one that is due to sensitization to certain foods or pollens, to fatigue, to overeating, or to undue exposure to temperature changes. Yet there are colds that are communicable — and what is never to be forgotten, certain of the communicable diseases, particularly measles, are ushered in by these same symptoms. The safest system to follow is to exclude every child who has a train of symptoms of watery eyes, nasal discharge, cough, and particularly sneezing. If this condition is accompanied by fever, then by all means the child belongs home in bed and not in school, no matter what diagnosis might be made later. When measles or other communicable dis-

eases are prevalent, a more rigid exclusion must be practiced. If the community is not yet educated to the importance of the 'common cold,' then undue strain can be placed upon the entire health program by the too rigid exclusion of every child with a running nose.

It is not possible for the teacher to acquaint herself with the signs and symptoms of all communicable diseases without special aid and assistance from the school nurse or physician. One of the most valuable contributions that can be made by the nurse and the physician is to instruct teachers in the things for which they should look at the time of the morning inspection. The teacher should freely turn to these specialists for their assistance and guidance. It is not possible to have physicians and nurses in sufficient numbers to conduct personally the inspection of all children. This would assume a professionally trained person for each class. To delay the inspection in any one room until the school nurse can reach that room means, of course, that children with possibly dangerous conditions are allowed to remain in the class until great damage has been done in exposing other children. Early and prompt action is the essential factor in the control of spread of contagion either in or out of school. Such prompt action can be given only if each teacher plays her part.

The morning inspection does not by right start in school. It belongs in the home. When a parent sends a child to school with definite symptoms of illness that are inimical to that child and to his fellows, then that parent does not know the importance of such conditions. That parent is ignorant of one of the responsibilities of parenthood. This fault, which at all times is a menace to the safety of the entire community, can to a large extent be overcome by making each failure a teaching example. When an ill child is sent to school, that child should not merely be excluded from school — but should be taken home, preferably by the nurse. The parent should be carefully instructed in what damage she has done to the child and all of his associates. The parent should be shown how to make the morning inspection of the child before he is allowed to leave home. Children who are ill should stay at home. This point should be emphasized on all occasions. Parent meetings, demonstrations, and all such school groups offer opportunity for emphasis on this point. In addition, it is well to sound a note of warning on the overemphasis of the value of one hundred percent attendance in a classroom. Perfect attendance records undoubtedly are too often dearly paid for at the price of epidemic conditions.

Once the child has been excluded by the teacher, taken home by

the nurse, teacher, or other responsible person, the school's responsibility has not ended. A diagnosis of the child's condition must be obtained at the earliest possible date. This frequently becomes a matter for solution by the local health authorities. The health department should be notified and a physician dispatched to the home. The physician, be he from the school or the department of health, should as far as possible make all diagnoses in the home. This not only allows for the more prompt exclusion and removal of the potentially dangerous child from the school group, but it also allows for the instruction of the parent in the management of the case, the detection of additional cases in the family, and the earlier establishment of quarantine where indicated. All reports of such diagnoses must be returned to the school at once, so that the teacher may know what steps to follow. If the excluded child was ill with a communicable disease, then special daily inspection of all pupils in that class should be carried on during the incubation period of that disease.

It is only through the coöperation of teacher, nurse, physician, department of health, and parents that epidemics can be prevented in school. And further, where such coöperation does exist, it is possible to make the school age a period freer from communicable disease than any other period in life.

#### IV. IMMUNIZATION AGAINST CERTAIN DISEASES

Not all communicable diseases can be prevented by artificial immunization. The list is practically limited to prevention of smallpox, diphtheria, typhoid fever and, to a certain extent, scarlet fever. The school owes a definite obligation to the entire community in respect to these conditions. It is not enough that the children in school be protected against these diseases, for they are more common and severe among the preschool ages. The school in addition should use its entire influence in seeing to it that the community is educated to diphtheria prevention. Whenever a child has lived to the age of entering school without being protected against this disease, then it means that the community health-education program has not functioned completely. The school can properly take the attitude that when it has to protect a child against diphtheria or smallpox, it is, in principle, doing something for the parent that should have been done by that parent years before; in short, a school immunization program should be a final, not a first, effort to protect a community.

## V. INSPECTION FOR PHYSICAL DEFECT

The participation of the school teacher in the physical inspection of the school children is a desirable thing. It is neither possible nor desirable for the school to afford a complete physical examination of all pupils of all grades every year at the hands of the school physician. It is, however, highly desirable to select those children who do have gross, uncorrected physical defects, for it is this group that represents the failure to achieve the ends of health education. These are the ones who either do not know what constitutes good health or who do not know how to attempt to attain it. The inspection of the children by the school teacher accomplishes several purposes: first, it gives each teacher a better knowledge of the physical condition of the children; second, it selects for medical examination those children who are most in need of such attention; third, it affords the teacher a medium for imparting worth-while health information to the children; fourth, it secures a better coöperation between the teacher, nurse, and school physician; fifth, as a result of the first four, it increases the amount of remedial and corrective work done for the children by physicians and dentists.

The school teacher is not expected at any time to make a specific diagnosis or to suggest a specific line of treatment. To do so places upon her a responsibility that should be borne entirely by a physician.

It has been demonstrated that the teacher is competent to pass with fair accuracy upon the physical health of children in respect to such points as nutritional condition; vision and hearing disturbances; abnormalities of teeth, tonsils, skin, cervical glands, thyroid, and orthopedic system. She can contribute also by observing signs of faulty function of heart, lungs, and nervous systems. In this work, as in the control of communicable diseases, the teacher should have some instruction and assistance from the school physician; she should have the help of repeated demonstrations in the method of inspection and repeated check-up examinations by the physician.

A few words concerning the physical defects the teacher can 'diagnose,' in the sense already explained.

a. *Malnutrition.* One of the most important conditions that deserves early detection is a faulty nutritional state. There is no help to be gained here by weighing and measuring children; that measures growth, not nutrition. A nutritional defect that has been present so long and to such a severe extent that it interferes with growth is one

that should have been noted long before. The commonest manifestation of malnutrition is loss of subcutaneous tissue (fat) over various parts of the body. This can be detected with fair accuracy by feeling of the arms, the thighs, and the ribs. There are instruments of precision for measuring the amount of fat more exactly. This work has been developed by the American Child Health Association. The malnourished child is frequently abnormally tired and easily exhausted. There may be a lack of luster to the eyes. There may be a posture change that can best be described as 'sagging.' There may be a pallor of the mucous membranes. None of these signs has a high degree of objectivity — the child must be looked at and evaluated as a whole, and his present condition compared with that of the past. Again it is necessary to emphasize that weight in relationship to height and age is of little or no value in estimating the nutritional condition of any child or group of children.

*b. Vision.* For certain visual defects there is a high degree of objectivity. The school teacher should be able to determine with reasonable precision the visual acuity of all the children in her room. This calls for the use of the Snellen chart — or one of its modifications. It is advisable for the teacher to test each child at least once each year — better twice a year. The Snellen chart, however, does not disclose all the defects that need be referred to the specialist for further consideration. Certain eye strains may coexist with normal acuity. These frequently can be detected by obtaining a history of headache from reading, watering of the eyes, or inflammation of the eye following close application to work. Strabismus should be noted by the teacher, as should also inflammation or granulation of the lids.

*c. Hearing.* Many ways of testing the hearing of children have been used. Lacking the more elaborate instruments of precision — the 4A audiometer for example — the most reliable test to apply is that of the spoken voice. What the teacher wishes to determine is whether a child can hear what is said in the classroom. For this purpose the whisper test and the watch test are not desirable. The teacher should measure a distance of twenty feet — in units of five feet each. Then by having the child turn sideways and by blocking the far ear, the test can be carried out by using the ordinary conversational tone of voice. It is best to carry on a conversation of questions and answers with the child instead of giving test phrases to be repeated. This reduces the psychological element to the minimum. Any child that cannot hear the spoken voice at twenty feet has a definite impairment. The degree

of this impairment can be determined by moving up five feet at a time and testing again.

*d. The Teeth.* There are two major abnormalities of the teeth that can be considered by the teacher, in addition to the degree of cleanliness. These are decay and malocclusion. Dental caries is important. Too frequently attention has been focused on a particular tooth to the practical exclusion of the general dental condition. A child with his first set of teeth may be as much in need of dental care as a high-school child with decay of the first molars. Teeth do not decay because of lack of brushing or merely because the child eats too much candy. Decay occurs as a manifestation of a general bodily condition. When there is decay of the deciduous teeth, it is apt to connote the presence of certain detrimental factors that will contribute to a similar destructive process in the second teeth.

Improper alignment of the teeth, with deformity of the dental arch, may be of the greatest significance in the child's general bodily health. It usually calls for extensive and early correction.

*e. The Tonsils.* Physical inspection of the tonsils is the least productive of consistent results of all the inspections that may be carried out. The examination of tonsils is the least objective in nature. This applies to the examination by physicians as well as to that by the school teacher. A history of frequent sore throat, evidence of enlargement of the glands of the neck, repeated colds and infection, are significant in evaluating tonsil health. The points of the most importance on inspection alone are evidences of infection manifested by an excessive redness, swollen, congested blood vessels, and ragged appearance. These findings, when conjoined with a history pointing to infection, warrant attention on the part of a physician.

*f. The Skin.* In conducting a general inspection of school children, the teacher should always include the skin. In this connection it is well to remove the clothing to the waist. Scabies, ringworm, and impetigo are the most commonly encountered disturbances. However, it is not unlikely to discover by inspection one of the more serious acute infectious diseases, such as scarlet fever, chickenpox, or measles. Any eruption is important. Since it is not within the province of the teacher to make a diagnosis, all cases of skin abnormality should be referred to the school physician, nurse, or private physician for their opinion.

*g. The Cervical Glands.* In the fore part of the neck there will be noted a prominent muscle that extends from the line just behind the ear

to the top of the sternum (breast bone). This muscle divides the neck into two triangles. The cervical glands lie in the front triangle and are connected with the tonsils and the nose and throat cavities. Any inflammation of these parts may cause the cervical glands to become enlarged. Abscessed teeth, diseased tonsils, and sore throat are the most common causes of involvement of these glands.

*h. The Thyroid.* The thyroid is a gland at the base of the neck in the mid-line and extending slightly to both sides. In its normal state, it cannot be seen and seldom felt. When it is enlarged, it is termed a 'goiter.' Any enlargement of this gland to the extent where it can be seen or readily felt is an abnormality and calls for medical care. The thyroid is a gland of internal secretion and is closely linked with the other glands of internal secretion. Abnormality of function of the thyroid may lead to a complete derangement of the other internal glands, with grave consequences. Even though a child is not 'suffering' from a small goiter, there should be prompt medical attention in order to prevent complications in later life.

*i. Orthopedic Defects.* The more obvious physical defects of locomotion are comparatively easy to detect and to place under treatment. It is the more subtle thing that deserves the major attention of the teacher. Defects of posture, abnormalities of the spine, and marked flat feet, all demand careful consideration by the school. Frequently these defects indicate some deep-seated ailment that can be brought to light only by searching examination by the physician. The child with a faulty posture may be suffering from a serious nutritional disturbance that should call for anything but so-called 'corrective gymnastics.' Or this same obvious fault may be due to such far-removed causes as cardiac disease or eye strain. Again, it may be a purely hereditary bodily conformity, since shapes and curves of the spine are definitely transmissible to offspring.

*j. The Heart.* It is not within the scope of the teacher's training and experience to make an inspection of the heart, yet she can be of material assistance in aiding the school physician to select those cases in need of special examination or care. Fainting spells, shortness of breath, cyanosis (blueness of the lips or hands), all point to some evidence of cardiac disturbance. Then, too, the teacher frequently secures information from the child or parent hinting at a history of heart disease — information that should be passed on to the school physician. Parents have sometimes secured from physicians who fail to understand the present-day school system certificates requesting children be

excused from swimming or gymnasium work because of bad hearts, when in reality there is no cardiac disease. All cases referred by private physicians should be re-examined by the school physician in order to secure proper placement of the child and to make rearrangement in the school activities if indicated.

*k. The Lungs.* Very little can be told about the lungs by the ordinary type of examination applied to elementary-school children. At this age tuberculosis can seldom, if ever, be diagnosed by use of the stethoscope alone. Many school systems have discontinued this examination as a routine procedure. Only the adult type, or the moderately advanced case of tuberculosis, can be discerned by this method. The childhood type and early tuberculosis call for the use of the X-ray. Tuberculin skin tests, with a careful X-ray examination of all positive reactors, have been the only aids in discovering such childhood types of cases. There is no way that anyone can tell by looking at them, or weighing them, or using any other simple procedure, which children are harboring tuberculosis infection. Yet the teacher can be of great assistance to the physician in selecting individuals who should have the more careful type of examination. At times there comes to the teacher information about other members of the child's family, relative to their having tuberculosis or suspected tuberculosis. It may be that this information never has been gained by the local health authorities, and therefore it should always be transmitted to the school physician, so that he can see to it that all children in the family are given proper attention and examinations.

*l. Nervous Disorders.* There are comparatively few diseases of the nervous system that affect children, particularly at the elementary-school level. Most of the so-called 'nervous children' are suffering, not from real nervous diseases but from faulty mental hygiene. Epilepsy and chorea (St. Vitus Dance) are two of the more common of the truly nervous disorders that will come to the teacher's attention. Both are very distressing and call urgently for expert medical care.

Chorea can be recognized by the symptom of uncontrolled, repeated, purposeless movements of some part of the body. This may involve only one member—a hand, leg, or some of the face muscles—or it may involve almost the entire structure. No matter what the degree of the severity, every such case should be detected at once, the child excluded from school and placed in bed. Chorea is a common condition following repeated or severe tonsillitis and rheumatic fever. It is almost invariably followed by a seriously damaged heart. The disease

is ordinarily of a self-limiting nature — lasting for from a few weeks to a few months. Without proper rest and medical care, serious damage is sure to result.

Epilepsy calls for far different treatment. Here the most distressing part is the seizure, or 'fit.' Such children need not be excluded from school unless their attacks are of such nature that they endanger the safety of the patient or embarrass the rest of the school or class.

*m. Other Defects.* There are many other conditions that should be noted by the teacher and referred to a physician for examination. A child may be too fat, he may grow too rapidly, his hands and feet may be larger than any normal child should have. These and other symptoms may point to some defect of the glands of internal secretion. There may be an abnormally shaped head, or legs with a peculiar anterior bowing, or peg-like teeth, or eyes with an opacity, all of which might have been caused by congenital syphilis. There is, of course, almost no limit to the pathological conditions that can be noted by the teacher who appreciates the appearance of the normal. Any marked deviation from the normal in any bodily structure should be referred to the physician for care and further consideration. The teacher cannot allow herself to fall into the attitude of the parents of such children; too often the parents have seen their abnormal child so long that the abnormality has come to be to them as nothing but a little 'queerness.'

The school physician working alone, without the aid and assistance of the teacher, can do little more than a routine inspection. The school teacher, working alone, without the assistance of a well-qualified school physician, is almost certain to become hopelessly lost in a field for which her previous training has not fitted her. The school authorities, accordingly, should afford their children the advantages of a unified program shared by teacher, nurse, physician, parents, and the community at large. When this is done, and only then, will it be possible to give to the community an appreciation of what constitutes good health and a knowledge of how to use the existing agencies of the community to alter and improve the faults in health conditions and practices.

#### VI. HEALTH HABITS

Because of its highly specialized content, 'health education' has tended to become separated from the more traditional fields of education. Further, it has secured its motivating force from physicians and

nurses who were inadequately trained in the psychology of education. Because of these two factors certain fallacies have been allowed to develop and remain in the teaching of health habits. School physicians and school nurses, primarily trained and interested in a medical-service program, have influenced the educational aspect of the work. The application of a bandage; the examination of a child for some physical defect; the prescribing or limiting of exercise, diet, play, or work; the diagnosis of communicable disease; the correction of physical defects; these are the things around which much of our health education has been built. It has been the men and women skilled in these branches of the humanities from whom we have obtained our field leadership.

Medicine has certain schools of thought that insist that all persons are born at least potentially wrong. The physician's attitude in approaching the child is then that of determining what might be wrong with him. When a fault was found and corrected the school physician and the school nurse felt that they had accomplished a bit of health 'education' and that the child had been taught 'health habits.'

There is still a more serious fault with many of our attempts at teaching health. Much that has been taught is at its best useless, and much is medically false. One well-known example is the teaching about the care of teeth. For a time great stress was placed on the brushing of teeth; tooth-brush drills were the order of the day. The child was impressed with the idea that "a clean tooth never decays." This was not only useless, but it was absolutely false. Brushing teeth never did prevent dental decay. First, the teeth cannot be cleansed by that method; and second, decay is due to a combination of factors of diet and disease far removed from the mouth itself. Clean teeth are desirable for an entirely different reason. They are a social asset. A child with clean teeth is not ashamed to laugh, not ashamed to talk, and to be seen. Dirty, stained teeth are a badge of social inferiority. It is a condition that simply does not exist among 'nice' people.

Similarly, much of the teaching as to proper diet has been entirely misleading. It is true that a variety of foods is desirable, but there is no one item of our diet that the average normal person must have. There is no one particular food that is essentially better for a school child than any other food. In the average American dietary there is an abundance of all the so-called 'protective' foods. There is on the whole a fair balance as to protein, carbohydrates, and fats. There are enough vitamins.

One by one all the so-called 'health habits' might thus be consid-

ered. On more careful analysis, we would find that the health content is slight or completely lacking, whereas the social aspect is of real importance. Frequent bathing is not a health essential. A person would live just as long, just as healthily, without a daily bath as with one. Undoubtedly he would not be as happy or as comfortable or as acceptable to his fellows as though he were to bathe more frequently. So, too, sleeping with open windows is not a health essential. In fact, under many conditions and under many circumstances it is of decided damage.

The sound social reasons for the development and perpetuation of the so-called 'health' habits have been overlooked or minimized, while school authorities have been engaged in pushing to the fore the unproved or even questionable health value of these same practices. There is no proof that there is an inherent drive for any individual to maintain health. The urge to regain health has been confused with the nebulous idea of retaining it. The one is decidedly definite and certain; the other has not been demonstrated. Any connection that might exist between the generally accepted health habits, a few of which have been discussed here, and life preservation is too vague to be of value.

Again, let us consider this matter from the viewpoint of the community. If the school teaches a child that 68° F. is the optimal, and therefore, the only permissible room temperature, a high price may be paid for this erroneous teaching. The child's parents have learned through long experience that the statement is not true; in fact, few persons can live comfortably in this temperature and continue with their present system of dressing, ventilation, and humidification of air. Not only is this teaching then discredited, but other sound and worth-while teachings are discredited, too. The community knows that the instructions regarding temperature are wrong; therefore it is apt to believe that the teaching in respect to a pure water supply is wrong.

What can be taught that does have a sound medical background? Every school child should be taught how to conduct himself in respect to the prevention of the spread of communicable diseases. He should know and employ such devices as medical science has given to protect himself from the careless exposure afforded by others. He should be encouraged to prevent the spread to others of such infection as he might harbor.

The greatest contribution that health education can make to a community is to impart knowledge as to how to use the existing corrective and prophylactic medical forces afforded by that community. The

school should be provided with adequate medical and nursing supervision, but this should never be considered as enough. Each child should be taught how to secure medical care for himself. Further, he should be shown that such medical care is a valuable means of maintaining and bettering his social and physical well-being. There is available within the average community sufficient medical skill to care for all classes of people. Once people have been trained to appreciate the advantages of curative and prophylactic medical care, and there has been created a demand for such service, the supplying of such services can be worked out. First must come education. It is within the province of health education — within the scope of the teaching of 'health habits' — to create this condition through the forces of the school system.



# CHAPTER XVIII

## THE DIAGNOSIS AND TREATMENT OF BEHAVIOR DISORDERS OF CHILDREN

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### I. OBJECTIVES

Sufficient knowledge to diagnose, predict, and control behavior is an ideal goal for the classroom teacher, as well as for the technical student of psychology. Behavior, broadly defined to include overt expression and inward responses, embraces the whole range of the school program as it affects children. The intent of this section, however, is to use the term 'behavior' in its narrower sense as pertaining to the overt action and mental and physical correlates of action of children in fields not covered by measures of achievement in subject matter and skill. Behavior of this type is often discussed under the terms 'conduct,' 'attitudes,' 'character,' or 'personality,' with an inclusiveness in the order named.

The objectives of constructive, preventive, and remedial work in social and emotional adjustment are in a broad sense the goals of all education. More specifically, however, students of the process are concerned with the development of desirable human relations while enhancing the personal satisfactions gained from interactions in the social group. In general, clinical workers have been concerned with extreme deviation and more commonly with deviation in the direction of inefficiency, discomfort, economic loss, and social stigma. As problems and methods have become clearer, there has emerged a philosophy of mental hygiene that envisages a constant planning for individual and social betterment for all. Teachers are rapidly coming to feel the desirability of an acquaintance with the general principles and methods of work that have evolved.

This chapter will present a theoretical orientation to the diagnosis and treatment of behavior, specific techniques for the location of children and the discovery of problems requiring special attention, and some general principles and methods of treatment. This will be fol-

lowed by a discussion of the diagnosis and treatment of specific social and emotional problems. The account will be concluded by indications as to certain administrative provisions that may be made for more effective work in these directions.

## II. THEORETICAL ORIENTATION

### 1. Behavior as a Function of the Situation

It will be helpful for the teacher to think of the behavior of an individual as a function of the situation. This is an enlargement of the concept that all behavior is fundamentally a release of energy set off by a stimulus. If the validity of the principle be granted, it is clear that theoretically the complete control of the environment would afford control of the behavior in it. Some few persons ascribe the major rôle to the situation. A considerable body of evidence, however, suggests that, while the situation sets off the response, the behavior is also a function of the individual who is stimulated. All persons do not behave alike in what appears to be substantially the same situation.

The conception of behavior as a function of both the child and the situation furnishes the clue for the diagnosis as well as treatment of behavior disorders. A behavior problem represents a discrepancy between the way a child behaves and the demands of his environment. Treatment, then, approaches the problem by changing the child, changing his environment, or changing both.

### 2. The Rôle of the Teacher

The personality of the teacher is one of the important environmental factors that may be involved in the behavior problems of children. To be successful in giving help, the teacher should seek an understanding of how her own bearing, language, and attitudes exercise subtle influences upon the behavior of children. Self-study and modification of point of view or practice may frequently be the first steps in preparation for more effective work with children.

Teachers, by virtue of their numbers and intimate contact with developing children, must eventually be the major personnel group for the application of mental hygiene to the general program of education. Of course, detailed technical information concerning family relationships, mental conflict, compensation, repression, release, conditioning, and similar concepts cannot be expected of every teacher, and the teacher will not, typically, carry her diagnostic procedure to such levels. She may, however, proceed on a level in which discovery,

situational analysis, and environmental management prove effective. Acquaintance with the technical aspects of child behavior should enable her to determine when to call for the assistance of such specialized workers as psychologists, psychiatrists, physicians, visiting teachers, and psychiatric social workers. A practicable technique should also make her an increasingly effective agent in carrying out recommendations for treatment based upon intensive, specialized study.

Because of the complexity of human behavior and its causation, there is perhaps a certain element of danger in setting up any materials which may function as a recipe or guide book. It is hoped that no person who seriously wishes to use the material will do so without special inquiry into the applicability of the suggestions to the particular case or situation at hand. It is probable, however, that we have had a philosophy of inaction in this field because of the unwillingness of workers to put down what has been done in the way of treatment. In addition, there has been an overemphasis on the damage teachers may do to children by attempting to use their abilities in these directions. Most teachers can extend with profit the range of simple techniques that may be employed in work with children. It should be recognized that, while the emphasis of the chapter is on the child who needs remedial work, such general principles of behavior study as are represented are also valuable in meeting the common problems of all children. The determination of need for special study and treatment is an early stage in diagnostic procedure.

### III. THE DISCOVERY OF CHILDREN IN NEED OF SPECIAL TREATMENT

#### 1. Major Techniques

In general the teacher interested in securing factual data is likely to find herself limited to (1) direct observation of the child in a casual or systematic manner, (2) a rating which she herself fills out, (3) a rating of the child based upon his reputation with associates, (4) a questionnaire on which the child or parent responds to certain questions, (5) a test of information about conduct or a test involving conduct in a trial situation.

Until a more complete psychological treatise of behavior and its measurement has been written and until comprehensive record-keeping is established as a phase of school routine, teachers must rely mainly upon direct observation and interview for obtaining behavior data. But both teachers and administrative officials should be aware of the implements in the process of development for more precise formulations

that will permit consideration of the problems of every child rather than simply of those that are outstanding in the situations.<sup>1</sup>

It is obvious that the method of approach will depend partly upon the problem to be studied and the use to be made of the record. Certain possible approaches have been sketched briefly in the following paragraphs.<sup>2</sup>

## 2. The Problem Record Log

One valuable method of locating problem children is to keep a chronological record of types of behavior that call for special attention. This 'natural-history' approach gradually defines the extent and nature of the problem for particular children. The cumulative record, as illustrated in one of the forms employed by the Treatment Planning Committee of Ann Arbor in coöperation with the public schools, permits designated persons (usually the principal) to make an entry each time a child is referred to the office for a problem of conduct or personality. A note is made of the date, the complaint, the person who made the reference, the person who is interviewed, and the decisions or recommendations. Frequent entries point directly to the need for special study and treatment. Similar records could be kept with profit by classroom or home-room teachers.

Blatz and Bott have made an intensive use of the method in a selected school by having the teachers use a journal entry method by weeks for misdemeanors.<sup>3</sup> Reports were made in terms of a standardized code and the data posted on individual record cards.

By making a record of constructive acts and contributions the method may also be employed as a guidance instrument for all children. The value of this approach has been illustrated in the work at the Rochester Athenaeum and Mechanics Institute.<sup>4</sup>

<sup>1</sup> A comprehensive account of technical instruments and methods may be found in Percival M. Symonds, *Diagnosing Personality and Conduct* (New York: D. Appleton-Century, 1931).

<sup>2</sup> Instruments for the measurement of character and personality are now too numerous to warrant extended discussion and mention in this chapter. The reader is referred to the annual summaries in the *Psychological Bulletin* and to issues of the *Review of Educational Research* for lists.

<sup>3</sup> William E. Blatz and E. A. Bott, "Studies in mental hygiene of children. I. Behavior of public-school children: A description of method." *The Pedagogical Seminary and Journal of Genetic Psychology*, 34: 1928, 552-582.

<sup>4</sup> W. W. Charters, "Education and research at a mechanics institute. VI. A character development study." *The Personnel Journal*, 12: 1933, 119-123.

### 3. Systematic Measurement by Direct Observation

The problem record log makes the sporadic, casual, direct observations a matter of record and extends the possibility of determining developing emotional or social problems. Progress in the field of personality study, however, now permits attempts to appraise child behavior in quantitative terms by systematic observation. So-called 'time-sampling' methods<sup>1</sup> have commonly paid careful attention to the definitions of the behavior to be observed and the number and variety of situations that must be sampled for valid and reliable measurements. The method tends to destroy the simple dichotomies found in casual and clinical observations and to point to the fact that many undesirable types of behavior exist in varying degrees in all children. The general method has been employed in the measurement of such types of overt behavior as aggressiveness, anger, coöperation, crying, emotional instability, fighting, leadership, nervous habits, resistance, social interaction, and talkativeness.

The method permits of greater precision in the discovery of children with undesirable behavior deviations. Since the method requires that someone give time regularly and systematically, its use to date has been largely confined to investigations in the psychology and sociology of development.

### 4. Rating Scales

Problem behavior in children is rather generally recognized as existing in various amounts. For many purposes, therefore, it is desirable to get a complete description of every child in a school, ranging from superior to inferior in social and personal adjustment. Time-sampling methods accomplish this within the areas observed. Another method, more economical of time, is to view an observer as both an analytic and synthetic instrument from which judgments can be secured on the basis of past observation instead of making records of each event as it occurs. The gradual definition of traits and problems crystallizes during the course of experience with the child, and the report is sharpened by such refinements of technique as have been introduced into the rating method. Thus, the Haggerty-Olson-Wickman Behavior Rating Schedules<sup>2</sup> secure a report from the teacher on the

<sup>1</sup> For a résumé of such methods, see Willard C. Olson and Elizabeth M. Cunningham, "Time-sampling techniques." *Child Development*, 5: March, 1934, 41-58.

<sup>2</sup> Published by the World Book Company: Yonkers-on-Hudson, 1930.

type and persistence of certain overt behavior problems in children and also judgments on personality traits by a graded graphic rating method in which each degree of a trait is defined in terms of trait actions. Through statistical scrutiny of the results secured, a quantitative method of scoring has been devised, so that two numerical indicators of actual and potential problem tendencies are obtained. These represent what might be called 'global' scores for the individual and attempt to inventory and evaluate the child's assets and liabilities in the way of adjustment. The extent of agreement of this method with other approaches gives an index of its validity. Reliable and valid uses of rating scales are usually confined to situations where the rater has many opportunities to observe the kinds of behavior to be desired.

### 5. Nomination and Questionnaire Method

At times the problem seems to be to locate with the greatest rapidity and with the least expenditure of money or time those children in the school system who are most urgently in need of attention. Various methods have been employed to secure data of this type. Frequently the teacher is simply asked to *name* a few children in the room whom she believes to be serious problems. In other instances a prepared form designates more clearly the type of problem that is to be nominated.

Another method of approach through nomination is to have the children in the class respond to a series of word pictures in which they list the names of the children to whom the statements apply. Agreement in the nomination tends to cancel individual prejudices in the report and yields a type of data consistent with other approaches. The "Guess Who" test advanced by Hartshorne, May, and Maller, in their investigations of character, exemplifies this method.<sup>1</sup>

### 6. Personal Data Sheets

A variety of devices have appeared in recent years in which the subject himself reports on his behavior. If he is sufficiently unsophisticated or sufficiently in rapport with the examiner, he may be willing to describe himself honestly within the limits of his competence as an observer. On the other hand, in a desire to make a good impression, he may deliberately falsify his report and render interpretations difficult. In some of these devices an attempt is made to conceal the objec-

<sup>1</sup> *Studies in the Nature of Character. II. Studies in Service and Self-Control.* (Macmillan: New York, 1929, 559 pp.)

tives, but it is doubtful whether this is ever completely accomplished with most alert respondents.

The Woodworth-Mathews Personal Data Sheet<sup>1</sup> and numerous modifications of a similar approach utilize such questions as the following:

59 Do your teachers generally treat you right? Yes No

Various types of self-reporting have been used on the college level. Among these are the Thurstone "Personality Schedule," the Bernreuter "Personality Inventory," the Laird "Personal Inventory," and the Allports "Ascendance-Submission Reaction Study." The series of attitudes scales by Thurstone and others cover important portions of the social and emotional life of individuals in relation to such issues as religion, the church, race prejudice, economics, and politics.

#### 7. Test Methods

Tests in the field of character and personality may be directed at the informational aspects of social standards or may attempt to set life situations to which the subject reacts. Thus, the test of knowledge of social usage by Strang, Brown, and Shatten<sup>2</sup> uses the first approach in testing information concerning table manners; taste in dress and appearance; good form in talking, walking, and meeting people; behavior at performances and games; and respect for property. The child responds to a series of 100 items with respect to the acceptability of the behavior as in the example:

93. Help yourself to your friends' books, papers, or other possessions without asking permission. ( )

Similarly, in Tomlin's<sup>3</sup> test of knowledge of social standards the child must indicate which is the best and which is the worst of four alternatives as in the following example:

4. Tom agreed to mow Mr. Brown's lawn for twenty-five cents  
After he began, he found that it would take him a day and a half. He  
should

- . . . get more money or quit
- . . . ask his father if he ought to finish the job
- . . . finish it
- . . . ask Mr. Brown to help him

<sup>1</sup> Published by the C. H. Stoelting Company, Chicago.

<sup>2</sup> Published by Teachers College Bureau of Publications, Columbia University, New York City.

<sup>3</sup> Published by the Stanford University Press, Stanford University, California.

Other informational tests have been designed for testing a knowledge of right and wrong, ethical discrimination, legal information, and good citizenship. The diagnosis and treatment of problem behavior is, however, far more complex than locating areas of inadequate information and meeting the lack through an instructional process. The hardened juvenile delinquent of good intelligence may know the socially accepted answers to many questions without giving evidence of it in his conduct.

A second general test method has developed on the thesis that measurement must be made in connection with situations in which the behavior has an opportunity to occur. May and Hartshorne, for example, in the Character Education Inquiry used considerable ingenuity in devising such situations. The method may be illustrated by Maller's group test of honesty in school work, "The Self-Marking Test."<sup>1</sup> Each child is supplied with a test blank giving problems in geography, history, arithmetic, etc., provided with a key, and instructed to score his own paper. Fifty questions are so easy that the child answers them correctly; another fifty, however, are so difficult that correct answers are improbable, and hence, if present, indicate that the child resorted to the key to increase his score.

#### IV. PROCEDURE IN INDIVIDUAL STUDY

##### 1. The Relation of Discovery to Treatment

The techniques described in the preceding pages may be used in surveys, research, and in the location of children for treatment. Frequently a teacher, school official, or clinic becomes interested in the individual study and treatment of a given child because of some precipitating circumstance, such as disobedience, stealing, truancy, or irregular sex behavior. Less frequently, the concern is due to some persistent or abruptly appearing personality trend, such as seclusiveness, day-dreaming, or fears.

##### 2. The Case Study

Informed analysis of the factors involved in a given problem is facilitated by having at hand careful records concerning the individual child and his personal and family history. A case report for a child will commonly include data on name, age, sex, grade, place of birth, the

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<sup>1</sup> Distributed by Bureau of Publications, Teachers College, Columbia University, New York City.

nationality and marital status of the parents, a socio-economic appraisal,<sup>1</sup> the number of brothers and sisters, the position of the child among the siblings, and any characteristics of the family significant for the child's behavior.

The most expedient procedure in securing basic historical material on a young child is often the parent interview. Older children may supply data in a direct interview where basic record keeping for all is not a part of the school routine. The fact-finding interview usually involves the use of prepared forms, although care must be taken to be unobtrusive in recording and to secure motivation in order to gain ready responses from the person interviewed. For certain problems, of course, the fact-finding interview may furnish the occasion for, and merge subtly into, the treatment interview. More detailed consideration of treatment aspects of the interview will be given later.

An autobiography may be utilized in a case study as an aid in securing the child's own view of his problems and associates as well as for gathering facts concerning his history, interests, and vocational experiences.<sup>2</sup> The autobiographical method may also serve as a basis for the establishment of rapport and for the discussion of mental conflicts and adjustment difficulties.

Data on intelligence, school achievement, special abilities and disabilities, interests, vocational aptitudes, and social and emotional adjustment should appear in intensive studies. Methods for securing measured records of the foregoing types are discussed in other sections of this Yearbook.

The objective of the case record is to give a basis for judgment concerning profitable modes of procedure. Eventually the account should include interpretation of the significant factors, and a chronological record of further developments, recommendations, and treatment notes.

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<sup>1</sup> For technical aid on the appraisal of socio-economic status see the Sims Score Card, published by the Public School Publishing Company, Bloomington, Illinois, or the Chapin Scale for Rating Livingroom Equipment, published by the University of Minnesota Press, Minneapolis, Minnesota.

<sup>2</sup> The autobiography may be secured from groups as an exercise in written composition. Such a procedure may, however, fail to reveal certain desired types of data, because of interest in literary quality or unwillingness to report intimate experiences in such a social setting. Methods of securing the autobiography and the significance of the material in clinical work have been discussed by Lowell S. Selling, "The autobiography as psychiatric technique." *American Journal of Orthopsychiatry*, 2: 1932, 162-171.

### 3. Diagnostic Classifications

The case study will often permit the classification of the problems of a given child in terms of groupings made on a theoretical basis as a result of the study of large numbers of children. Classifications are helpful in so far as they give suggestions for treatment.

The uniform record card prepared by the Commonwealth Fund<sup>1</sup> utilizes the following headings and subheadings and standardizes the procedure somewhat in an accompanying manual:

<i>Conduct</i>	<i>Personality</i>	<i>Habits</i>
Bullying	Daydreaming	Enuresis
Cruelty	Fears	Masturbation
Destructiveness	Hyperactivity	Thumb-sucking
Disobedience	Inattention	.....
Lying	Seclusiveness	
Sex delinquency	Sensitiveness	<i>Educational Problems</i>
Stealing	Shyness	.....
Temper tantrums	Stubbornness	
Truancy	Unpopularity	<i>Others</i>
.....	.....	.....

The arbitrary and overlapping character of such a classification is, of course, clearly recognized. The pluralistic nature of causation does not automatically make the categories directive as to treatment. In connection with the classification given it may be helpful to think of conduct problems as being more responsive to environmental management, personality to direct treatment of the child, habits to a training program, and educational problems to instruction. Usually, however, a complex of the factors is involved. The modern tendency is to avoid a fixed diagnosis and to substitute for it a continuing study of the case during which the factors bearing on the symptomatic behavior may emerge and may be dealt with experimentally to determine whether successful outcomes accrue. While some of the procedure must be on a cut-and-try basis, the whole is dominated by a knowledge of dynamic mechanisms based on clinical experience and research.

### 4. Selection of Children for Educational Therapy

The discovery that a given child requires treatment does not necessarily mean that the teacher can or should be the effective agent in

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<sup>1</sup> Mary Augusta Clark, *Recording and Reporting for Child Guidance Clinics* (The Commonwealth Fund: New York, 1930).

administering it. An important part of her task consists in enlisting individual, group, home, and specialized coöperation.

Undesirable emotional and social behavior may arise through the ordinary processes of learning. These may at times require the specialized services of a school psychologist when one is available. Many forms of behavior disorders are also directly traceable to organic defects.<sup>1</sup> Frequently both are involved, so that both organic and functional approaches to treatment must be adopted. In general an attempt should be made to rule out all ascertainable physical factors before proceeding solely on a psychoeducational basis. Not a few pediatricians, psychiatrists, and general medical practitioners may be found who have some special competence for giving advice from both the physical and psychological points of view. A very large proportion of the behavior problems of physically normal children must, however, be met, if at all, by the teaching personnel. Certain general principles will now be considered which offer a guide to a more intensive consideration of specific problems.

## V. GENERAL PRINCIPLES OF TREATMENT

### 1. Multiple Causation and Varied Approach

The problem presented by a given child is always unique. The multiple nature of causation in the field of behavior precludes the writing of any simple, uniform prescription for behavior disorders. Practice is still in the stage where frequently there is no precise agreement on the specific procedures to be recommended. Behavior problems do not emerge as isolated phenomena, and a specific maladjustment is likely to carry with it some degree of general maladjustment. For example, there is frequently a concomitant occurrence of inability to read and certain related emotional or behavior disturbances, and it is often difficult to determine which is antecedent and which is consequent. From the treatment point of view, if you can help any aspect of the total picture, you are likely to help all, particularly if the approach is fundamental and related to the causative framework. If the approach is not so related, the submergence of one disorder may simply be signalled by the appearance of another.

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<sup>1</sup> See, for example, Earl D. Bond and Kenneth E. Appel, *The Treatment of Behavior Disorders Following Encephalitis* (The Commonwealth Fund: New York, 1931, 163 pp.).

## 2. What Is Symptomatic Treatment?

In general the formulation, "Treat causes, not symptoms," is sound, in that it tends to force a study of the factors behind the symptoms. There has appeared, however, from time to time, an uncritical condemnation of the treatment of symptoms in behavior problems — a condemnation based on mere analogy with organic disease or on a wholesale acceptance of theories of behavior causation that reject the formulations of the academic psychology of learning. If the symptom is the result of the repetition of some phase of behavior that has satisfying consequences, there is a clear analogy to the laws of learning as formulated in the acquisition of skill and information or through the experimentation with conditioned reflexes. If such is the case, the removal of the symptom through direct work on a learning basis is synonymous with cure. This view is, of course, heretical to many persons dominated by other systematic approaches.

Nursery schools and other schools are constantly demonstrating that behavior problems in normal children can be modified through the same direct attacks characteristic of learning in other fields. Whether such an attack is fundamental depends on whether contributory factors have been properly sought and accepted or rejected as the major source of the disturbance. It is futile, of course, to direct a training approach to a problem where an organic defect is the basic factor. It is equally futile to argue that social and emotional learnings have nothing in common with intellect and skill. Our expanding boundaries of knowledge should presently bring about a concurrence among the controversial issues involved. There is already a growing tendency in clinical practice to avoid carrying the level of analysis and treatment to a point beyond that needed to effect the desired changes. In many situations the teacher will find little success in a direct approach on a symptomatic basis. Effective work will usually require an indirect approach through multiple underlying etiological factors.

Some general principles for behavior management through environment will serve to suggest numerous applications to the thoughtful teacher. The procedures should not be considered solely as methods for solving behavior problems or for immediate control, since they are of broader application and carry with them the possibility of the modification, through learning, of the organism itself.

### 3. The Principle of the Graded Stimulus

Whenever a child meets what is to him a radically different situation, the possibility of inadequate response arises. The corollary is that adequate adjustment to new situations is fostered by a gradually increasing application of the given stimulus.

The general principle may be illustrated by what happens to young children upon first encountering the school environment. Table I, based on entering kindergarten children, shows the percentage who indicate some maladjustment by crying upon each of the five opening days of school. The percentages are often higher in nursery schools. Gradual adaptation to the new situation is indicated in the table. The experience of workers suggests that the situation is much improved by

TABLE I.—THE ADJUSTMENT OF KINDERGARTEN CHILDREN TO THE FIRST FIVE DAYS OF SCHOOL AS REFLECTED IN THE DISAPPEARANCE OF CRYING AS A SYMPTOM

Day	Boys (N = 82)		Girls (N = 77)		Total (N = 159)	
	Number	Percentage	Number	Percentage	Number	Percentage
First	8	9.8	4	5.2	12	7.5
Second	4	4.9	2	2.6	6	3.8
Third	3	3.7	1	1.3	4	2.5
Fourth	1	1.2	2	2.6	3	1.9
Fifth	1	1.2	1	1.3	2	1.3

(1) spreading the introduction of children over a few days, (2) having the child and parent visit the school in advance, and (3) planning to avoid extraneous disturbances or lack of equipment incident to the opening of school. The detailed psychology of the process need not be discussed here.

Other examples are to be found in the gradual exclusion of light where a child has been conditioned to sleeping with a light, the gradual lengthening of the child-control period in the treatment of enuresis, and the gradual withdrawal of an adult from a setting where he has taken responsibility for some aspect of a child's behavior. In a general philosophy of development it is, of course, clear that the pertinence of the principle in given situations changes at different ages. The college orientation week represents a recognition of the same principle.

### 4. The Principle of the Added Stimulus

Response does not occur in the absence of stimulus (external or internal). Modifications of the organism, apart from maturity, do

not occur without stimulation. After an analysis of a situation, missing stimuli may be added for treatment purposes. We shall not pause here to consider the large changes in school and home regimen that are often recommended after analysis on the basis of this general principle.

Let us borrow an actual illustration of a more subtle use of the formulation. John, upon entering the nursery school, withdrew from other members of the group, appeared insecure concerning his status, and was unable to establish contacts. After analysis of the situation, the teacher procured a toy that was entirely new and arranged the setting so that John was the first to secure it. The stimulus value of the toy, added to that of John himself, produced responses toward him on the part of other members of the group. The resultant enhancement of self feelings (ego) on the part of John was, subjectively at least, the beginning of an expanding process of socialization.

### 5. The Principle of the Subtracted Stimulus

Since behavior may be thought of as a release of energy set off by a stimulus, particular behavior may be controlled and gradually modified by the removal of stimuli conducive to undesirable or undesired responses. Thus, in the treatment of nervous, over-active children, a line of action may be based on the reduction of sensory bombardment through simplification of the environment. The same principle is applied in the relaxation and sleeping programs of some schools.

### 6. The Use of Language in the Control and Modification of Behavior

The universality of the use of language in human relations makes it a tool of large actual and potential importance in the control and modification of child behavior. Scattered studies on the use of praise and reproof, or on the effect of the simple formula, 'Right' and 'Wrong,' indicate the importance of a more conscious use of the tool.

Some of the finer nuances in language control are now being studied by Wilker in the child development laboratories at the University of Michigan. She has experimented with the effect of variation in the language formula on the behavior elicited in a large number of situations. Experimental and control groups have been employed with various criteria on the efficacy of control. In general, she finds that effective response is secured in so far as the words used are directive and point to the desired goal. Words that block action

rather than direct attention along the desired line are clearly to be avoided. 'Do' is more effective than 'Don't.' Words should be encouraging rather than discouraging and point to success rather than failure. Words must be selected that have some relation to the child's stage of learning, and they are more effective when accompanied by the postural, gestural, emotional, or material influences necessary to help the child respond to them.

A study in progress by Olson and Wilkinson at the University of Michigan suggests that the effective teaching personality as a whole is indicated, at least in part, by the nature of the language used by the teacher in the control of behavior. Sheer quantity of verbalism seems to be relatively unimportant. The extent, however, to which the teacher is positive and constructive in her words used for behavior control is an item of some importance. The teachers with the most favorable general ratings avoid negative statements. Similarly, the effective teacher directs her statements to the person she wishes to reach and does not, from irritability, indulge in blanket responses to the class of children as a whole.

When one considers the cumulative effect over the years of the type of language control to which children are subjected, the possibilities of desirable and undesirable responses to the language influence of associates may readily be appreciated.

### 7. Manual Guidance as Treatment Technique

In general, in work with older children, a 'hands off' policy is indicated for behavior control and modification. Educational workers with children, however, do make use of manual control in securing behavior of desired types. It is usually necessary to affect a child's feelings, thoughts, and actions in order to secure desirable behavior outcomes. Guiding the thoughts and actions of a child through remote control does not always secure the desired result. The general laws of habit formation suggest that, if the outcome is a desirable one, the stimulus used must be attached to a desired response if the behavior is to be secured in the future in response to similar stimuli. Nursery-school teachers who employ the habit approach give manual assistance in the case of faulty food habits, toilet habits, or sleep habits. The efficacy of the procedure can easily be demonstrated, and the practice will probably be continued as long as no disputing evidence is forthcoming. It must be said, however, that giving manual guidance is a skilled performance and giving it firmly, unemotionally, and patiently comes only with extensive training. For the uninitiated,

the technique may merge very easily into punishment and may then arouse anger responses in the recipient of the attention. Judgment and knowledge must also be exercised to determine whether the objective sought is desirable or necessary at the age of the child who is the subject of the teacher's attention.

#### 8. Physical Punishment as Treatment Technique

Spanking and other forms of corporal punishment have largely disappeared as an element in the management of modern schools. Today it is considered a sign of inefficiency and incompetence for a teacher to resort to striking or pulling ears and hair, and such behavior is seldom encountered on the part of emotionally well-adjusted teachers. The shift away from physical punishment has in part been a deduction from the experimental studies of learning in animals and the accumulation of evidence that directive and rewarding methods are much more effective than punishment. Physical punishment also carries with it the possibilities of complications, such as sex stimulation, injury, or legal action. Most psychiatrists, psychologists, teachers, and social workers are agreed concerning the undesirability of physical punishment. It remains as a home practice, particularly with young children, for a large number of parents. As a rule, the better the education and social background of the parent, the less frequently is spanking adopted as the method of punishment. Physical punishment leading to submissiveness or revolt has no place in the philosophy of the modern school, which looks forward to coöperative activity.

#### 9. The Isolation Technique in Treatment

In general, the careful teacher attempts to avoid situations in which a child is given the feeling of being cut off from a group. An occasional child, however, may 'go to pieces' so completely as to disrupt either the comfort or activities of his associates in a room. Nursery-school teachers, in particular, have found it highly advantageous to remove such a child from the group to a place where he may relax and acquire control without being a distracting influence or attracting the attention he may be seeking. In some instances special rooms have been set aside for this purpose. The isolation technique must be used skillfully in order to be an educational experience for the child, gradually modifying him in the direction of greater control. This goal may be defeated if the child regards the treatment simply

as punishment and develops a feeling of antagonism toward the teacher.

The isolation technique in the simple sense of 'social distance' has also been used successfully in the management of eating and sleeping problems. The thoughtful teacher will make a careful study of the situation in order to promote the welfare of both the group and the individual. She should be ready to vary her technique sympathetically in terms of the developing situation.

#### 10. The Equipment of the Playground and Room as Treatment Technique

Current investigations suggest that the selection and management of equipment is an important factor in the armament of the modern teacher in her development and control of behavior in the room. The simple addition of constructive play material on a playground has been shown to make a large increase in the coöperative activity that occurs and a marked reduction in the amount of fighting and quarreling. Similarly, certain types of equipment tend toward the practice of individualistic play, while other types lead to the promotion of group contact and extroverted activity. The teacher who is not familiar with the possibilities in this direction can be aided enormously by simple suggestions concerning the arrangement of centers of interest in the classroom or on the playground. Equipment can be managed to promote harmoniously both individual and group objectives.

#### 11. The Treatment Interview

The interview represents one of the major instruments for treatment work in the field of mental hygiene and behavior. While a considerable number of suggestions as to technique have appeared, an adequate psychology of the process has never been written. One of the goals of the treatment interview is to produce rapport between the child and the interviewer. The interviewer may choose to be a more or less passive person, who without specific design makes use of the gradually developing situation to accomplish understanding and help. He may, on the other hand, adopt an active rôle, in which he is on the alert both as to techniques for eliciting types of information desired and in interpreting freely with the subject the possible significance of the material.

In conducting such interviews with very young children, equipment is sometimes used to mediate the responses of the child or to

elicit a better rapport. The amputation doll of Levy, the social-situation picture test of Schwartz, or the frequently used plastic material and art work are examples of the use of such devices. The conducting of interviews on an analytic level, with the subtle management and sophisticated interpretations then required, probably is out of place in the repertoire of most teachers. Certainly the often quoted methods of Melanie Klein and Anna Freud have little to offer except to practitioners with abnormal cases.

The psychodynamics of the interview are hard to describe, and the effects are hard to evaluate. The clinical hunch is that 'something happens'; the precise nature of it is uncertain. We must resort to such generalizations as the reënforcement of stimulation, the redintegration of responses, reconditioning, emotional release through expression, and the law of effect. These and other principles appear to operate in the interview situation. The teacher who is able to step out of the authoritarian rôle and engage in treatment interviews may find a ready tool for the resolution of conflicts between herself and the child and thus substitute coöoperative approaches for possible antagonism. The teacher must, however, know the length to which to carry the interview from the point of view of the child's emotions. Practitioners of the interview technique have frequently had to struggle with the problems created by transference and identification with the parent or other persons. Teachers generally should be aware that their approaches should be on an educational rather than a psychiatric level, and that possibilities of actual damage exist in unskilled probing of the deeper emotional life of children. The interview that assures the child of a sympathetic adult in his world, of someone who can see points in him to approve, is a facilitation worth working for in the treatment of children. The parent interview, if it adds to the teacher's understanding and leads to important modifications in attitudes of parents, is exceedingly important in work with problem children.<sup>1</sup>

## 12. Duration of Treatment

The study of behavior suggests the need, for effective work, for early and long-continued programs of treatment. The child's preschool years have already developed well-defined personality patterns that are subject to only gradual modification. At no stage can a given worker control all of the factors important to the problem. The need

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<sup>1</sup> Esther Heath, *The Approach to the Parent* (The Commonwealth Fund: New York, 1933, 163 pp.).

for length and continuity of program requires that the organization of a school permit a progressive development of a treatment plan involving a succession of teachers. Possible types of supervisory coördination are indicated later in the chapter.

Minor disturbances in behavior often respond to brief treatment, whereas more serious cases may resist for long periods the best treatment that we can apply. The continuity of most behavior problems is clearly indicated in a study of the prediction of delinquency now being prepared for publication by the writer.

### 13. Evaluation of the Effects of Treatment

It has usually been necessary to accept a subjective, personal judgment on the effectiveness of treatment, embodied in such a question as, "Did the behavior disappear or become modified in a desirable direction?" Even when an answer is 'yes,' we may have no evidence that given elements of the treatment were effective in the improvement. The reader should not accept as the last word the necessarily dogmatic presentation that has been combined from case histories, clinical experience, classroom experience, and applications from psychological theory. Each person must usually test his practice with the question, "Does it seem to work?"

In closing a case, a clinical staff may muster all available evidence for a decision on whether a given case is adjusted (successful), partially successful, or unadjusted (failure).<sup>1</sup>

## VI. THE TREATMENT OF SPECIFIC SOCIAL AND EMOTIONAL PROBLEMS

The foregoing pages have supplied the general orientation and principles underlying treatment methods. Specific difficulties, however, also call for specialized information on diagnosis and treatment. A brief discussion of some of the major categories follows.

### 1. Aggressive Antisocial Conduct

The symptoms include resistance to suggestion, intimidation of other children, hitting, bullying, inappropriate behavior, inattention to work, and unwillingness or inability either to coöperate or to comply.

Factors to be taken into account include possible unwise handling

<sup>1</sup> See Porter R. Lee and Marion E. Kenworthy, *Mental Hygiene and Social Work* (The Commonwealth Fund: New York, 1929, 140 ff.). For a measured appraisal of outcomes see Elise H. Martens, *Adjustment of Behavior Problems of School Children* (Government Printing Office: Washington, 1932, 78 pp.).

of the problem by adults in the child's environment. There is always the possibility of 'identification' of the teacher with the mother, with a possible transfer of the behavior patterns of the home to the teacher. The work in the room may be too difficult for the child unless special adaptations are made for individual differences. On rare occasions the work may not offer sufficient difficulty and variety for the child of high ability.

The teacher should avoid negative statements and methods. The suggestion of constructive courses of action appears to aid in management and modification. A conference with the child on his attitude toward home, school, and life in general is usually indicated. Such interviews may form the basis for the resolution of any conflicts that may exist.

Under usual conditions untreated children with the types of behavior described may be expected to become court cases in much larger numbers than children in general.

## 2. Stealing

Stealing will occur frequently enough to be reported for about one out of forty children in school. Under a rigid definition, it probably occurs in some measure in all children. Repetition of the offense indicates a particular need for treatment.

Among the factors to be considered are (1) the social group in which the child moves, (2) lack of home training in the use of money, and (3) strong incentives for dishonesty as compared to honesty. Occasionally stealing may be compulsive and associated with the stimulation of sex impulses.

Approaches to treatment include an interview to gain the child's point of view, an interview for parent attitude, and provision for experience concerning responsibility and use of money and property. Deeper analysis and treatment are required if the stealing is compulsive in character.

## 3. Overactivity and Related Disorders

The child in this classification is restless, irritable, fidgety, high-strung, and often appears to be 'wound up.'

The causes are complex and medical coöperation is essential. Among common-sense procedures for the teacher may be the subtraction of stimuli. The child may be placed in a smaller group for quiet activity at certain times of the day. Opportunity for rest, relaxation,

and liberal opportunity for large muscle activity may be provided. Room planning may extend to securing sound-absorbent materials for the walls and equipment.

The child will probably persist in this type of behavior for some time. Wise handling by the teacher makes the problem less acute for both the child and his mates.

#### 4. Organ Inferiority and Behavior

A child who differs physically or mentally from other members of the group often suffers because of the effect of the difference on the behavior of others toward him. In one neighborhood, children had written in chalk on the sidewalk: "Harry is thirteen years old and only in the third grade."

Adler has given intensive consideration to organ inferiority and its psychical compensation. Variation in bodily proportions, sensory defects, and crippling may serve as the origin for feelings of inferiority with reactions directly indicative of the condition or indirectly indicative through compensatory behavior. At times the feeling of inferiority may have its roots in experience, with no demonstrable organ inferiority. The thoughtful teacher will be alert to the development of health attitudes in the child of limited mental or physical capacity. The general concept is closely related to the study of other types of deviation from the characteristics of the group.

#### 5. Racial, National, Linguistic, Religious, and Socio-economic Deviates

Children who differ from the mode of the group in color, national origin, language, religious affiliation, or cultural background may exhibit symptomatic reactions either in the direction of withdrawal or of attack (compensation). The deviations affect the behavior of other children toward the child who deviates and hence determine his responses in undesirable ways. If children 'call names,' draw social lines, and form aggressive coalitions, the possible effects on the child in the way of feelings of difference and inferiority become important. The incidence of such problems will naturally depend on the composition of the school group.

In treatment the teacher may select materials from history, biography, science, literature, business, the arts, statesmanship, etc., in such a manner as to inform the entire group concerning the dignity and achievements of all groups represented in the class. This should be

done as a part of the ordinary school program without any intimation as to a specific objective. Any school materials written so as to cultivate prejudice should be avoided. Calling on deviate children for unique contributions may be employed to enhance their self feelings (ego) where the desirability of such expansion of personality is indicated.

#### 6. Dress and Personal Appearance

The children in this classification will be readily recognized as unkempt and slovenly in dress, with dirty hands and nails. Less frequently the problem will be that of too great fastidiousness in dress and appearance. About 3 percent of the children will show extreme disregard for dress and personal appearance and about 1 percent will show extreme fastidiousness. The significance of immature habits of dress should also be noted under "Maternal Overprotection."

Inadequate clothing is usually a direct result of poverty in the home. The importance of symptoms in dress lies less in the appearance, as such, than in the effects of the appearance on the behavior of others toward the child, with consequent modifications in his own behavior.

The first step in treatment is to secure information concerning home conditions. If the economic level is low, possibilities for unobtrusive aid through relief agencies may exist. School facilities may be utilized for habit-training programs in cleanliness; generalized attitudes may come later.

#### 7. Oral Habits: Thumb-sucking, Finger-sucking, and Nail-biting

Because of frequency of occurrence, objectivity of symptoms, and implied relationships to nutrition and sex, oral habits have occupied a large place in the clinical literature. The problem has been discussed from the point of view of various specialists. The dentist may see that the habit of thumb-sucking affects the teeth and jaws. In speech correction the chief concern is with the effect on structure and on the use of the muscles of the mouth in relation to correct speech. The physician or public-health worker may see a potential source of infection from the hands. The psychiatrist may see primarily evidence of emotional unrest or insecurity or a continuation of behavior of food-seeking in infancy. He may attempt to link it up, too, with the more general pleasure-seeking trends (including sex) of the individual. The psychologist is apt to view the problem as one in learning.

He may assume that the child develops this movement by repetition, and may trace its beginning to some specific irritation or stimulation, such as cutting the teeth, a hangnail, or a desire for food.

The habit seems a superfluous one, but there is no one recipe for eradicating it, for there are too many factors to be studied in each case. A number of facts about the behavior are known and certain approaches have appeared profitable.

One of the surprising things revealed by a systematic study of oral habits is that they occur much oftener than the average person suspects. If a group of children in school is observed repeatedly for twenty periods of five minutes each, a few children never show the habit and a few show it on all twenty occasions, while the average child exhibits the habit during one half of the observational periods. The figures suggest that these mannerisms must be regarded as a normal part of human behavior, and it is only their occurrence in exaggerated form that sometimes suggests that special attention would be desirable.

Oral habits do not tend to disappear rapidly with age. The mannerisms tend to be modified, however, so that the thumb-sucking of early years gives way to nail-biting and simply bringing the hands to the lips.

Oral habits are more frequent among girls than boys and among children who are underweight. Brothers and sisters and twins tend to resemble each other, and there is some evidence of the effect of imitation in that close association with children having the habit tends toward an increase in amount. The children of neurotic parents show a slightly higher incidence. A given child shows the habit more markedly when he is emotionally excited or very tired. Children engaged in activities with their hands show fewer occurrences than when they are just sitting around. A small relationship can be demonstrated between oral habits and the growth of the jaw. Children who have marked oral habits apparently have sore throats more frequently than children in general.

The number of methods and devices proposed for the treatment of thumb-sucking, nail-biting, and similar habits are indicative of the interest that persons have taken in the problem. The application of bitter solutions to the fingers, metal devices, mittens of metal or coarse cloth, arm splints, pinning down of arms, restricting movements with tape, are only a few of the mechanical methods proposed and used. Most of the students of the problem feel that those are not ideal solutions and the treatment may have more undesirable consequences than the habit itself. Since the habits are only semi-voluntary in character, they prove quite resistant to treatment by

any method, and human nature is so complex that a method may produce results opposite to those desired

The point of view which grows out of such a comprehensive survey of what is known is that every factor that is favorable to a reduction of the habit should be used before proceeding to any direct work with the child. Otherwise, there is danger of proceeding on a symptomatic basis, which does not touch the underlying causes. There is still some disagreement as to the best method of handling the marked problems, and it is probable that no method is equally good for all children. The principle of a varied approach must be employed.

There are certain things that parents and teachers may do if they feel that a young child presents a real problem. It is usually wise not to let the child know that you are concerned; children may use the habit as an attention-getting device. A physician should be consulted to determine whether general health conditions are satisfactory and whether there is a suitable schedule for feeding and sleeping. The oral insufficiency theory suggests that, in infancy, the sucking period and rate of milk flow from the bottle must be taken into account. By the provision of blocks and materials requiring the use of the hands, a teacher may lower the manifestation of the habit in young children. Avoidance of emotional excitement and scolding is helpful. Adolescent girls have sometimes apparently been helped by giving them equipment for caring for the nails and hands. Older children have sometimes been helped by explaining in a matter-of-fact way why the habit is considered undesirable, but such explanations are often quite ineffective, and obviously would not aid the young child whose language and thought are still immature. One worker has even tried the experiment of having older persons practice the habit before a mirror with the mental resolution that they will not practice the habit in the future (treatment based on Dunlap's Beta postulate).

A conditioning method has shown promising results with some young children at nap and bedtime. The technique requires calm and patience. The child's hand is removed gently from the mouth as he is going to sleep, saying "Out" simultaneously in an approving tone. When the manual movement and the word "Out" become well associated, the word alone will bring about the removal of the hand. An approving nod or word may be used as success is achieved. If the conditioning is done carefully, the habit should finally be inhibited by the child's own organization without further external aid. For some time, as other unfavorable factors occur in the way of illness and fatigue, the child may lapse into his former ways. If there is spontaneous recovery, nothing should be done. If the habit is again persistent, retraining may be necessary. If at any time the habit-training shows evidence of simply changing the undesirable habit

from one form to another, it means that some underlying health or emotional condition has not been solved. Among other factors, the child requires a feeling of confidence and security in the family relationship.

#### 8. Nervous Mannerisms

Persistent peculiar movements of any kind merit the attention of the teacher. They may be evidence of an easily corrected condition or of a deep-seated organic or personality difficulty. Facial grimaces, blinking eyes, jerking muscles, stereotyped movements, writhing hands, tremor, and peculiarities of gait suggest the need for medical examination and a coöperative treatment program.

#### 9. Genital Habits (Personal)

The symptoms noted may be manipulation of genitalia, thigh-rubbing, body-rocking, flushing, and emotional excitement with no apparent external stimulus.

The incidence of the behavior is sufficiently high to be noted in school settings in about one out of thirty children. Some behavior of this type is present in some degree in all children, according to the best available information. Its appearance in unusual settings or with feelings of guilt constitutes the problem to a larger extent than the behavior itself.

Among the possible factors must be considered phimosis (elongated foreskin), irritations, sedentary work with pelvic congestion, and faulty sex education. More complicated conceptions include attention-getting mechanisms, infantilism (in older children), and narcissism.

The teacher must avoid the common community attitude that this is reprehensible conduct, and take the view of the specialist who regards it simply as another item of behavior subject to inherent impulses and modification through learning. It will usually be desirable to recommend medical examination by a physician who has had recent training in child work or who has kept up with the field of sex education. Sometimes a conference with the parent concerning the home program may be advisable. In the classroom, an opportunity to move about (which has many justifications on other grounds) may be provided. Opportunities for sex education (under other names) may be provided as a part of the activity and instructional program.

### 10. Genital Habits (Social)

Symptoms under the heading include exposure, sex play, wrestling with erotic symptoms, and attempts at homosexual or heterosexual intercourse.

The occurrence is infrequent in school settings and more frequent in home, institutional, playground, and gang associations.

Among the possible causal factors are curiosity, attention-getting, initiation by another child or adult, and inadequate sex instruction in the mores of social groups.

The educational program in home and school should satisfy the normal curiosity of children and give information concerning the positive values of sex as well as the reasons for existing taboos. To be effective, this should begin early and develop naturally in the home setting.

The normal curiosity of young children concerning matters of sex usually becomes adjusted to conventional mores with age. The method of bringing about the adjustment takes one squarely into the field of research and theory, since the modifications may be brought about by methods that impair later normal functioning.

### 11. Maternal Overprotection

This pattern of behavior is diagnosed in the school setting by solicitude of the mother, occasionally the father (paternal overprotection), about a variety of problems that are either insignificant or non-existent. It may be diagnosed on the basis of the child in school by unwillingness to separate from mother, by continuation of infantile modes of dress, and by a high degree of dependence on adults.

While no exact data are available, a rough approximation would be that about one child in fifteen would fall into this category in a rather extreme fashion if maternal behavior is taken as the criterion.

Among possible factors are an inadequate emotional adjustment on the part of the mother, compensatory behavior for an unwanted child, babying of a child who appears long after a family was established, and solicitude over an only child by parents who had not expected to be able to have a child.

Successful progress depends on a gradual change in the parent attitude. If the attitude carries over into the sleeping arrangements in the home, recommendations that the child have a separate bed and a separate room are in order (if economic circumstances permit). If

inappropriate dress is part of the picture, suggest that the child be dressed in clothes suitable for his age. Maternal overprotection as a symptom may apparently appear in a parent at times without any serious difference to the child. Obvious cases of maternal or paternal overprotection persist into adult life.

### 12. Prepsychotic Trends

The few accounts available suggest that children in this classification tend to secure a reputation among teachers and children as being queer, without any very exact localization of symptoms.<sup>1</sup> The child may be shy or temperamental. Other symptoms that are being experimented with at the present time include feelings of persecution, attempt to lay blame on others, overreaction in talking and movement, shrillness of voice, and unusual sensitivity to praise and blame. Symptoms such as those mentioned are very common among children in general. What constitutes pathological deviation is uncertain.

Unstable neural organization, whether hereditary or acquired, may be a part of the picture. Conflict due to ignorance in the field of sex adjustment is frequently revealed. Inability to reconcile religious beliefs and behavior is sometimes a source of difficulty. Feelings of difference are reported often by those who later suffer some sort of breakdown. Certain aspects of withdrawal behavior may be related to this general pattern.

### 13. Withdrawal Behavior

This category overlaps certain others. The child wishes to be by himself and does not participate in the life of the group. A distinction should be made between *constructive* withdrawal, in which the child is securing self-expression and achievement of certain types by withdrawing, and *destructive* withdrawal, in which inadequacy (real or imaginary) and repression are evidenced. More specifically, symptoms may be sitting and staring, crying, or 'on-looker' behavior.

Withdrawning behavior is normal at times and in certain situations for all children. Persistent withdrawal with many evidences of emotional involvement suggests the need for attention.

Possible factors include social, emotional, physical, or mental immaturity, as compared to others in the group. The child's status in

<sup>1</sup> J. Kasanin and Louise Veo, "A Study of the School Adjustments of Children Who Later in Life Became Psychotic." *American Journal of Orthopsychiatry*, 2: 1932, 217-230.

the group (in terms of his ranking on various traits) may be taken into account. General suggestions as to treatment are indicated in the discussion of the "Principle of the Added Stimulus."

#### 14. Fears

The child is the exception who does not carry about with him some vaguely localized or specific fears. Fears of the supernatural, animals, the dark, being alone, kidnappers, robbers, strange noises, physical danger, and death are frequent among children.

From time to time school-workers and clinicians encounter children whose fears apparently result in a generalized anxiety. Such feelings may extend to fear of participation in games or group activities, to the school, and to teachers. General discussion may relieve the tension and reassure the child. Specific fears may be reconditioned by exposure to experience with the object of fear with an associated stimulus, such as a friendly adult. Fear of animals can usually be dealt with successfully in this manner.

#### 15. The 'Escape' Responses

The child is recognized by unwillingness to participate in school work, by a tendency to place blame on others, by running away from home, or by truancy. The incidence of behavior in this category is particularly heavy among the overage and mentally retarded children. Truancy is especially frequent between the ages thirteen and fifteen.

Among the possible predisposing factors are (a) too much responsibility in the home; (b) difficult living conditions; (c) too much or too difficult work for the child's ability in school; (d) development through a long-established habit of reaction away from irritating situations; (e) desire in the child for punishing parents or parent substitutes; (f) relief from monotonous, sedentary work; (g) adventure with companion or companions (social hunger), and (h) feelings of 'not belonging' (because of racial, social, or economic differences).

The interview technique may be employed to determine factors which are operative. Several possibilities are open to the teacher where they are indicated after analysis of the situation. Selection of subjects and tasks clearly within the ability of the child, individualization of study techniques, avoidance of invidious competitive comparisons, emphasis on the child's progress in terms of his own achievement, greater opportunity for gross motor movements, and active participation in either curricular or extra-curricular aspects of work are possi-

bilities to be considered. The dull grade-school boy of advanced age may be promoted to the junior high school with a modified program. The teacher should avoid an authoritarian rôle and should attempt to establish confidential rapport.

## VII. ADMINISTRATIVE AND SUPERVISORY ORGANIZATION FOR THE TREATMENT OF CHILDREN WITH BEHAVIOR PROBLEMS

The work of the individual teacher in the classroom may be strengthened if regard for behavior objectives has permeated the curriculum, methods of teaching, and administrative and supervisory functions of the school. Possibilities for effective work are enhanced further by coöperative efforts utilizing the resources of the community.

Character education emphasis in the curriculum, cumulative records, special classes and schools, nursery schools, parent educators, camps, school counsellors, clinics, and treatment-planning committees represent some of the types of provisions which have been made.

### 1. Character Education

The concept 'character education' is sufficiently broad to include both individual adjustment (guidance) and group approach (curriculum and methods of teaching). Specialists dispute the efficiency of these two emphases. The clinician notes the individual nature of the problems presented, their deep-seated emotional significance, and the absence of correlation between action and knowledge in the field of social and emotional behavior. He thinks little of attempts to affect conduct by teaching abstract virtues or knowledge 'about' institutions and social relations. At the other extreme a small group of character educationists have faith in direct instruction in ethics and citizenship or in the transfer values of indirect approaches through science, social studies, literature, and the like. A more eclectic approach recognizes that behavior is a composite of heredity, maturity, emotion, habit, and intellectualized attitudes and knowledge, and welcomes evidence on the means for desirable development and modification from all serious students of the problem.

The supervisor and teacher will find in the character-education literature valuable suggestions for the classroom approach. Thus Heaton<sup>1</sup> gives concrete ways in which the teacher may use the regu-

<sup>1</sup> Kenneth L. Heaton. *The Character Emphasis in Education* (The University of Chicago Press: Chicago, 1933, 415 pp.).

lar curriculum to secure character values, how units of instruction may be employed, the rôle of clubs and special activities, and the organization and administration of schools for individual guidance. Techniques and materials involving use of conflicts, case discussion, informal conversation, participation in research, dramatization, and stories are described and illustrated.

## 2. Rôle of the Cumulative Record in Understanding and Treating Behavior

We have indicated that a knowledge of the situation, alone, is inadequate for effective work with the behavior of children. A knowledge of the child in his familial and social setting and his past experiences is fundamental to understanding why, at a given moment, he responds as he does.

The person who wishes to do constructive, preventive, or remedial work in behavior is at once struck by the inadequacy of our ordinary school record-keeping machinery for supplying the basic types of information necessary or desirable for intensive work. Careful workers have long recognized the desirability of having comprehensive cumulative records for each child. In the past, administrative officials frequently have felt that the time and effort put into careful records was not repaid by the practical services obtained. Current researches indicating how the past behavior of the child gives one an index to his future behavior and the activities of various national bodies are now gaining the confidence of many persons concerning the keeping of such records and convincing them that they will pay dividends from both the practical and scientific points of view.<sup>1</sup> To be of service for students interested in mental hygiene and behavior, such records must include pertinent facts concerning personal and family history, incidental data, vocational interests, parent interview records, treatment interviews, problem record logs, behavior rating, etc. The American Council of Education and various research centers are developing and studying records of this type.

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<sup>1</sup> Thus we find the Subcommittee of the Committee on Commerce of the United States Senate presenting an imposing array of opinions supporting the needs for such records if the schools are to play an increasing part in the prevention of delinquency and crime. See *Subcommittee on S. Res. 74. Crime and Crime Control*. Government Printing Office: Washington, 1934, p. 62.

### 3. The Special Class.<sup>1</sup>

From time to time schools have segregated all the children presenting either behavior or emotional disorders into adjustment classes, with a special program to meet their needs. In some instances the grouping has the dual function of considering the interests of the well-adjusted children who remain in the regular classrooms as much as the interests of those who deviate. There is, here, of course, the same fundamental conflict as in other special class activities as to whether it is more desirable to have the children remain in normal groupings (but with special help) or to be segregated. In at least one school system it was found that the gang morale developed in a class of antisocial children was such as to prevent effective work on the part of the adult. In another, it was difficult to find teachers who could stand the nervous strain of handling groupings of children with marked antisocial behavior.<sup>2</sup>

### 4. The Special School

The special school in a number of places has apparently met some of the advantages of the special class in the way of program-making, and at the same time has been able to provide a more normal social setting in terms of the distribution of ages, unification on a larger social basis, and special planning to meet the individual needs of children on both the educational and behavior sides.<sup>3</sup> The better of these schools are aimed at adjustment and guidance rather than discipline or punishment. The school is made attractive, the best possible teachers are secured, and modern educational practices are introduced. An attempt is made to remove all stigma from attendance at the school.

<sup>1</sup> A more extended discussion of the use of special schools and classes for behavior problem children may be found in the Report of the Committee on Special Classes of the White House Conference on Child Health and Protection, Charles Scott Berry, Chairman, in the volume on *Special Education*, pp. 491-534. (Published by Century, 1931.)

<sup>2</sup> These observations, it will be understood, apply to special classes for children presenting serious conduct problems. Special classes for children whose mental deficiencies are not thus complicated are another matter. A properly devised and administered educational program is then a valuable agency for social adjustment.

<sup>3</sup> Suggested details on the operation of such schools may be obtained from the annual reports of the Montefiore School, of Chicago, or the Thomas A. Edison School, of Cleveland.

Such schools are not used as a threat in the hands of principals or teachers to discourage wrong conduct. Their personnel may include doctor, nurse, psychologist, psychiatrist, visiting teacher, and special teachers for speech or for remedial work in reading. Recently, an attempt has been made to have children referred to the school by the school authorities rather than by court action. A real attempt is made to understand the background of the child before he goes to the classroom. This is in accord with the practices in the more progressive schools everywhere.

### 5. The Nursery School

Children frequently enter school with well-defined behavior problems, and many adult disorders are also traced to early experiences. These facts suggest the desirability of experimental programs that reach the very young child. While nursery-school programs have numerous objectives, all have had the hope that in them lay the possibilities for early socialization and the prevention of emotional disorders. The experimental work to date suggests that many of these hopes may be realized in nursery-school settings.

### 6. Parent Education

Workers in nursery schools (as in clinics) found that the locus of a child's problems was frequently in the home or the parents. This realization resulted in an increased emphasis on parent education, which has taken many forms — attempts to raise the general level of knowledge concerning child care and training through lectures, recommended reading, study groups, conferences, and observation, and also direct help on the personal problems of the parent. At higher age levels, the work of parent-teacher associations has tended to find its problems in the parent-child-teacher relationship. Parent education, as such, is growing in importance in the programs of the associations.

### 7. The Camp

A voluminous literature testifies to the enthusiasm of many persons for the character-building possibilities of the summer camp. A number of experimental uses of camps as treatment agencies are now being made. The Treatment Planning Committee of Ann Arbor<sup>1</sup> works in

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<sup>1</sup> Information on the composition and work of the committee may be secured from the chairman, Professor Lowell J. Carr, Department of Sociology, University of Michigan, Ann Arbor, Michigan.

close association with community agencies and utilizes the University of Michigan Fresh Air Camp as a treatment resource. Exploratory studies of outcomes are under way.

### 8. The School Counsellor

Various types of special services have been attached to schools for assistance on behavior cases. These experimental variations have included persons who would be designated as a visiting teacher, an attendance officer, a psychiatric social worker, a school psychologist, or a vocational counsellor, depending upon the educational level at which they have been introduced or the functions which have been emphasized.

### 9. The Clinic

Various types of clinical groupings have been employed as a special service in studying behavior difficulties of children.<sup>1</sup> A classic organization of this type includes the services of psychiatrist, psychologist, physician, social worker, and visiting teacher, and enlists in its educational and service program a variety of community agencies. It may be organized as an integral part of a school system or as an adjunct for community service under other auspices. Since individual behavior study and adjustment are time-consuming tasks, clinics of this type do not pretend to reach all of the children needing such service in a community. They do attempt, however, to study the most urgent cases and to extend their influence in order that school principal, teachers, parents, or others concerned may be gradually acquainted with some of the methods of work. Less inclusive clinical approaches have stressed certain aspects of adjustment of the child in school and have left other aspects to private or community services of other types. At the college level, mental-hygiene services for students have been developed in connection with health-service programs.

### 10. Treatment-Planning Committee

Some communities have organized committees drawn from a variety of community agencies to plan preventive and treatment approaches or to organize an active clearing house for agencies already

<sup>1</sup> An account of the history, method of work, and integration of services in clinics may be found in the recent book by George S. Stevenson and Geddes Smith, *Child Guidance Clinics* (New York: The Commonwealth Fund, 1934, 186 pp.).

in existence.<sup>1</sup> Such a committee has many educational functions to perform in promoting a better understanding and interest among courts, schools, clinics, churches, welfare agencies, recreational leaders, club leaders, and camps. From its very character it may also serve as a point of departure for progressive developments in the field of prevention.

### 11. Training Programs for Teachers

The general level of understanding and practice in the handling of behavior problems by teachers may be raised by incorporating courses and opportunities for behavior observation in the training programs of teachers colleges. An examination of the current catalogs of progressive institutions reveals a recognition of the desirability of such training for the prospective teacher. The usual certification requirement does not, however, make a specific demand for this preparation, except as it may be met in some more general requirement in psychology or method. Most new entrants into the teaching profession will have had some contact with recent technical advances in the field of child behavior. Teachers' meetings, supervisory personnel, and library facilities may aid in acquainting teachers in service with the possibilities for modification of their own practices.

A growing body of literature on treatment is now available for use in the college classroom. Treatment helps for teachers are usually written to indicate not only a program of action but also some of the fundamental theory upon which it rests. A number of the publications of the National Committee for Mental Hygiene,<sup>2</sup> designed especially for teachers, are particularly useful. Such pamphlets as "Mental Hygiene in the Class Room" and "Behavior Problems of School Children" should be a part of the professional library of every modern teacher. Helpful recent formulations are those by Symonds<sup>3</sup> and by Sherman.<sup>4</sup> Among the periodicals, *Mental Hygiene*, *The Psychological Clinic*, *The Journal of Juvenile Research*, and *The American*

<sup>1</sup> See, for example, Virgil E. Dickson. "The Berkeley Coördinating Council." *Mental Hygiene*, 13. 1929, 415-519.

<sup>2</sup> The National Committee for Mental Hygiene, 450 Seventh Ave., New York City.

<sup>3</sup> Percival M. Symonds. *Mental Hygiene of the School Child* (New York: The Macmillan Company, 1934, 321 pp.)

<sup>4</sup> Mandel Sherman. *Mental Hygiene and Education* (New York: Longmans, Green and Co., 1934, 294 pp.).

*Journal of Orthopsychiatry* give particular attention to individual and environmental approaches to the treatment of children's problems.

### VIII. SUMMARY

Effective work with the behavior problems of children demands a program involving discovery, diagnostic study, and treatment. The informed teacher has a contribution to make to each of the three aspects of the general procedure.

Direct observations, ratings, questionnaires, and tests are now available as techniques to assist in the discovery of the children who are in the most urgent need of special study and treatment. The case study represents a practicable technique for determining some of the factors involved in the behavior disorders of a given child. Ideally, treatment is directed at the causative framework rather than at symptoms. The teacher may be aided in her treatment program by such general principles as are involved in the gradation, addition, and subtraction of stimuli. Her practice may be improved by a study of the psychology of language control, manual guidance, punishment, isolation, and environmental management. The treatment interview is a technique that warrants wider study and use among teachers. The general principles of procedure must be augmented by a study of the dynamic psychology involved in such specific groups of problems as antisocial conduct, overactivity, feelings of inferiority, nervous mannerisms, genital habits, maternal overprotection, prepsychotic trends, and escape responses.

Desirable behavior outcomes are facilitated by types of school and community planning that involve an emphasis on mental-hygiene values in the general program. Clinics and specialists attached to the school program may perform an educational function and render personal services to those children in the school who most need expert help. Increased experience with methods for the modification of behavior should make teachers more effective agents in carrying out recommendations for treatment based on specialized study. The growth of knowledge concerning social and emotional development places new responsibilities on the programs of teacher-training institutions.



## CHAPTER XIX

### DIAGNOSIS IN SPEECH

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Of the three tools, speaking, reading, and writing, speech stands apart as the master instrument with which man controls his social environment. Socially, it is at once the most important source of human stimulation and the most significant human response.

#### I. THE HANDICAP OF SPEECH DEFECT

Good speech is important vocationally, socially, and educationally. An individual with a speech defect is handicapped in each of these ways. Vocationally he is limited with regard to earning power and with regard to self-expression. Speech defectives make their vocational adjustments for the most part by limiting themselves to vocations in which normal speech is not of major importance.

Socially the speech defective is limited chiefly because he avoids experiences essential to learning social adaptations, to an extent dependent largely upon the degree to which he regards his defect as undesirable or even disgraceful.

Educationally the speech defective does not achieve at the level of his ability, and for three reasons: first, he is definitely handicapped in oral recitation, and the teacher unwittingly discriminates against him because of his poor showing in verbal expression; second, his speech defect is frequently associated with other defects, such as reading and writing disabilities; third, he is handicapped by bad emotional reactions caused by his speech handicap.

#### II. THE FREQUENCY OF SPEECH DEFECT

Careful surveys reveal that at least five percent of the school population possess speech defects of sufficient severity to warrant remedial attention. This is an astounding number when we realize how these children are crippled in the most personal and human characteristic of

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<sup>1</sup> Assisted by Wendell Johnson and Bessie Rasmus.

their make-up — it is probably safe to say that it is more important for a child to learn to speak correctly than it is to add or spell.

Although workers disagree somewhat in regard to the percentage at the various grade levels, all workers do agree that the percentage of children with articulatory speech defects decreases gradually from the lower to the higher grades, while the percentage of stutterers remains practically constant from grade to grade. About 10 percent of first-grade, and about 4 percent of eighth-grade, children present defects in articulation. About 1 percent of school children, regardless of age, stutter. Speech defects of all kinds seem more prevalent in preschool children than in any other age group.

### III. DESIRED OUTCOMES OF SPEECH INSTRUCTION

The goal in speech education is not only to locate and diagnose speech defects, but also to make the speech defective (and every other student) an effective speaker. Every person should be able to handle himself well in ordinary speaking situations, such as casual conversations and small group conferences, and in more formal speaking situations such as lecturing.

The aims and objectives of speech training may be listed thus:

1. To establish correct attitudes on the part of the student toward the speaking situation.
2. To make the student conscious of his own speech patterns and the speech patterns of others, to the extent that he is aware of how he and his fellows speak.
3. To discover the student's speech handicaps and inadequacies, and by efficient reeducation to redirect the use of his speech mechanism.
4. To allow students with special abilities in speech to achieve creatively and artistically.
5. To contribute to the development and stabilization of the personality of the student through the application of the principles of mental hygiene as they relate to performances in verbal communication.
6. To develop the speech of a child in such a way as to contribute to the growth of the whole child in school and society.

In a very general sense these outcomes are obtained by the skillful application of sound remedial and educational measures, by holding up to the student correct standards of speech (acceptable speech ex-

amples), and by leading him through a series of progressing speech experiences.

#### IV. DIAGNOSIS OF SPEECH NEEDS AND ABILITIES

Diagnosis in speech has for its main purpose the determination of the individual's abilities and disabilities in speaking, in order that a program may be established to fit individual needs. In such a diagnosis the following factors should be taken into consideration.

*a. Choice of Topic.* Does the student choose topics, the immediate purpose of which is to inform the audience about something? Is the topic worth talking about, timely, of interest to the speaker and listener?

*b. Choice of Material.* Is the material adequate for the general purposes of the speech? Is it carefully analyzed and carefully selected for each point in the speech? Does the student speak from a background with which he is intimately familiar?

*c. Organization of Material.* Is there a purpose; a plan; a main idea; proper partitions and transitions; subordination of details; adaptation of thought and material to the purpose, audience, and occasion; and an effective conclusion?

*d. Symbolic Formulation and Expression.* Is the student able to utter a coherent series of ideas expressed in language that is adequate and in a form that is essentially correct in regard to grammar, sentence structure, and vocabulary.

*e. Projection to the Audience.* Is the student able so to stimulate the audience as to get adequate response? Is he able to secure and hold attention in a specific speaking situation?

*f. Overt Bodily Activity while Speaking.* Does the student have poise and coördination in bodily movement? Is his bodily activity purposive, relevant, and effective?

*g. Rhythm.* Does the student speak fluently and rhythmically, without interruption of the flow necessary for good speech? Is his speech free of repetitions, hesitations, blocks, and stuttering?

*h. Articulation during Speech.* Are the speech sounds correctly produced?

*i. Voice and Voice Control.* Does the student's voice possess a basic quality that is clear, full, rich, resonant, and pleasing? Is the pitch of his voice low, medium, or high? Is his range narrow or broad? Is the pitch pattern flexible or rigid?

j. *General Effectiveness.* Is the student effective in terms of the total stimulus pattern set by him?

#### V. CLASSIFICATION OF SPEECH DISABILITIES

We may define a speech or voice defect as an unusually conspicuous deviation in the speech pattern of an individual that fails to bring about an adequate social response and thus constitutes a maladjustment to the speaker's environment.

Any classification of speech disorders must at present be tentative and imperfect. We do not know the exact nature of every disturbance of speech. In the present discussion we have considered speech disorders under two main heads: articulatory disorders and stuttering. Articulatory disorders are characterized mainly by the inability to produce or to produce accurately speech sounds, whether by themselves or in connected discourse. Stuttering is characterized by the repetition of sounds, words or phrases, and by partial or complete blocks on any given sound. It consists essentially of a disturbance in the *rhythm* of verbal expression.

#### VI. DIAGNOSIS OF ARTICULATORY SPEECH DEFECTS

To determine the type of articulatory disorder, it is important to locate, if possible, the contributory causes, of which there are many. It is wise to look first at the general predisposing factors, then at the more specific.

##### 1. History of the Child

Before everything else the teacher should know something of the child's familial stock and of his early development. Among the circumstances to be inquired about in the child's family stock are speech defects, mental deficiency, nervous and mental disorders, condition of the mother during the prenatal life of the child, birth injuries, early physical and mental development of the child, age of onset of talking and walking, emotional reactions, and progress in school. Also the social, economic, and racial environment of the child should be evaluated.

##### 2. General Physical Health

Speech is an expression of the general mental and physical condition of the pupil. The condition of the several organs and systems is therefore of great importance. The teacher is not expected to be able

to make a physical diagnosis, but she should be able to appreciate the findings of the physician and to recognize certain symptoms in order to refer certain children to him.

The condition of general nutrition is of paramount interest because nutrition is important for all lines of child development, including speech. Ill-nourished children are apt to present sluggish, careless, and inadequate speech, characterized by indistinctness and general slovenliness of utterance.

In connection with nutrition the teacher should consider such factors as weight, height, the relationship between these two, color of skin, body tone, posture, and body contour. Further, she should appreciate the meaning of deformities, asymmetries, and stigmata. The function of particular structures should be carefully noted for possible deviations from the normal. The teacher will be interested particularly in muscular weaknesses and paralyses, choreoid and athetoid movements and tremors. Manifestations of disturbance in the general health of the child are restlessness, fatigue, irritability, inattention, temper tantrums, indifference, and undue tenseness.

### 3. Specific Physical Factors

Many children are injured at, or subsequent to, birth. Although the teacher cannot often relate a speech defect to a given injury of the nervous system, she ought to know that damaged nervous systems cause specific speech abnormalities as well as more general speech deviations such as delayed speech and aphasic conditions.

*a. Lesions in the Cerebellum.* Lesions in the coördinating part of the nervous system, the cerebellum, reveal themselves through speech by a characteristic slowness, drawling, monotony, and scanning. In other cases the utterance is remarkably irregular and jerky. Utterances of many syllables, especially those which end a sentence, tend to be explosive. Both consonants and vowels are slurred and uttered inaccurately and irregularly. Frequently the effort to speak is associated with excessive facial grimacing. Although these children may not show any defect in forming different single sounds (either vowels or consonants), the pronunciation of the longer words, especially those with many lip sounds, causes great trouble. Further, there is incoöordination in respiration, which interferes with the normal functioning of the entire speech mechanism. Neither the strength of the voice nor the interruption of speech by respiration is regulated correctly to accord with the meaning of the spoken sentences. These chil-

dren usually start to talk with normal voice intensity, which decreases in a steady fall to a point of exhaustion.

*b. Lesions in the Cerebral Hemispheres.* Lesions in one hemisphere have a strikingly different effect upon speech than do those in the other hemisphere.

Those in the dominant hemisphere (the left in right-handed, and the right in left-handed persons) produce delayed speech and some variety of aphasia. In delayed speech the child is slow in the acquisition of spoken language; he may not talk until four or five years of age, and even then he learns more slowly than the normal child and his speech is generally not so good as that of the normal child. In aphasia the child lacks ability to execute with ease acts connected with articulated speech and to comprehend spoken words. He is robbed of certain forms of symbolic representation. A severe case may be deprived of articulatory speech, of the comprehension of spoken words, and of the complex activities associated with words (reading, writing, and the use of numbers).

Lesions in the non-dominant hemisphere do not affect the meaningful aspects of speech and intelligence so much as do those in the dominant hemisphere. If the injury is in the motor area, the physical interference due to the paralyzed or weak half of the tongue, lips, and cheek muscles produces slurring, indistinctness, and thickness in utterance. If the lesion is in other parts of the non-dominant hemisphere, no very noticeable defects in speech may be present, save a possible tendency to slight certain syllables, words, and phrases.

*c. Miscellaneous Lesions of the Nervous System.* Lesions in other parts of the nervous system affect speech more or less characteristically. In juvenile dementia paralytica the speech is slow, halting, uncertain, stumbling, slurred, and irregular, and there is a marked tendency to slight words and syllables.

In chorea the speech is jerky and irregular, on account of abnormal breathing movements. The words may come forth in a violent and explosive manner.

In myxedema there may be delayed speech development and several or all of the commonly noted sound substitutions and omissions. The voice is frequently dull, monotonous, and rough.

*d. Abnormalities of the Tongue.* There are no established standards regarding the size, shape, and motility of the tongue. Certain marked deviations from a somewhat rough standard may, however, be considered as abnormal. In general, any tongue that cannot be ex-

tended beyond the teeth is not free enough for good speech. Theoretically, a tongue-tie would affect every sound; practically, it affects most those sounds which require the air to be completely or largely shut off at the anterior part of the oral cavity. For instance, an *s* will become *th*.

The size of the tongue is important in relation to its control in articulation. An exceptionally large tongue may make it impossible to produce certain sounds correctly and difficult to form sounds in connected speech properly.

The anterior free portion of the tongue of the speech defective is apparently too short for the rapidity and variety of movements demanded in correct articulation. In some cases, however, it is too long. Then it interferes, not with the correct production of individual sounds, but with the bringing of sounds into connected speech.

Further, the shape of the tongue is important in speech. In the defective it is often irregular; one side is markedly different from the other.

Tumors of the tongue act as foreign bodies in the mouth cavity and cause speech to be thick and indistinct.

e. *Abnormalities of the Uvula.* Abnormalities of the uvula—abnormal length and thickness, bifurcation, and double uvula—interfere with articulation by causing the uvula to act as a foreign body in the pharynx and by pulling down on the soft palate in such a way as to prevent its rising in the production of the vowels. Speech is thus muffled.

f. *Intranasal Obstructions.* The most common intranasal obstructions are hypertrophied turbinates, deviated septums, and polypoid growths. They interfere with head resonance to change the quality particularly of the nasal sounds; *m* tends to become *b*, *n* to become *d*. Often nasal obstructions are only temporary, as in severe colds, when the turbinates become swollen and the nasal cavities are more or less closed.

g. *Cleft Palate and Harelip.* These two conditions are closely associated. Cleft palate is a congenital deformity, characterized by one or more fissures of the palate due to arrested development. The cleft may be anterior or posterior, and partial or complete. Harelip is characterized by one or more congenital fissures in the upper lip.

The child with cleft palate and harelip should be studied from various angles. It is not enough to say that the speech difficulties presented by cleft palate or harelip (or a large tongue or a bifurcated

uvula) are due to these abnormalities. The teacher much attempt to determine how much of his speech trouble is due to such conditions and how much of it is due to other factors, particularly the psychological and environmental. One individual may show almost no hard and soft palate with relatively normal speech, whereas another individual may show a relatively small cleft in the soft palate with strikingly abnormal speech.

In cleft palate and harelip, the sounds *m*, *n*, and *h* are the least affected; *k*, *g*, *s*, and *z* are the most affected. Sounds may be omitted entirely, improperly formed, or replaced by other sounds. All vowels are affected in the direction of overnasalization.

*h. Abnormalities of the Teeth, Jaws, and Dental Arches.* Correct form of the dental arches and proper occlusion of the teeth are necessary for perfect speech. The teeth serve to obstruct the clear passage of the breath in making certain sounds.

Normal occlusion is the correct relation of the teeth to each other and to the anatomy of the head; malocclusion is incorrect or unsatisfactory alignment of the teeth. There is no definite boundary between normal occlusion and malocclusion. Severe malocclusion often is associated with facial deformity, which manifests itself in unpleasing contour of the face, particularly the lower face. Severe facial deformities and malocclusion may cause particular difficulty with *s*, *z*, *j*, *th*, *sh*, *ch*, *l*, *r*, etc. Other dental deformities affect these sounds and others, according to the nature of the defect.

*i. Adenoids.* Adenoid vegetations may cause defective articulation and phonation directly by bringing about a relaxation of the soft palate and preventing its normal activity in talking or indirectly by interfering with the head resonance to make the voice muffled and indistinct. When a person has large adenoids, the closure of the velum is made against them. After they have been removed, the velum may continue to make the same amount of movement as before. This leaves a gap between it and the rear wall of the pharynx, which causes all sounds to be nasalized. Thus, not only the presence of adenoids, but also the relaxed palate after their removal, may cause defective phonation.

*j. Defective Hearing.* It is through the ears that we receive our most important source of stimulation for the development and maintenance of speech. A congenitally deaf child will not learn to talk of his own accord. Often a child who is learning to speak will gradually

stop developing further because of an acquired reduction in hearing. Acquired deafness in adulthood has a marked effect upon the individual's speech, because he fails to grasp the finer essentials of the sounds. Hearing is so important that the teacher ought to know something about the more common tests of auditory acuity and be able to carry out simple watch tests or speech tests of acuity.

#### 4. Psychological Factors

Speech defectives may not show any determinable deficiency in the sense organs, in the central nervous system, or in the speech mechanism. In these cases the teacher may search for more subtle and indirect psychological factors, such as mental deficiency, emotional maladjustments, faulty training, poor sound discrimination, or short auditory memory span.

a. *Mental Deficiency.* Speech is acquired more slowly and is more subject to disorders in the mentally deficient and retarded than in the normal child. All idiots (I.Q. 0-19), practically all imbeciles (I.Q. 20-49), and about half of the morons (I.Q. 50-69) have some form of speech disorder, including mutism and delayed speech development.

b. *Emotional Maladjustment.* Speech is fundamentally bound up with the expression and the repression of the emotional life of the child. In the young child particularly, when the speech function is still being built on its wobbly foundation, emotional reactions have profound influence in the establishment of good or bad speech reactions.

There are two common types of articulatory speech difficulties which may be traced to bad emotional adjustments. The first is 'baby talk.' As a general rule 'baby talk,' with its survival, 'negligent lisping,' is a symptom of unweaned emotional life, a prolonging of the earliest emotional stage of the child, the outcome of selfish inconsideration on the part of parents who coddle, and babble at, the child to gratify their own desires.

The second type of speech difficulty traceable to emotional conditions is delayed speech development. Generally speaking, speech will be acquired when there is a need for it. If a child is reared in a home where his slightest whim is anticipated, he will have little need for speech and may not develop it without more contact with the outside world. An only child in the home with indulgent parents and grandparents is thus liable to delayed speech development. In contrast there are other parents so introvertive and seclusive that they seldom

talk to each other or to the child. If the child so reared develops verbal communication, it is apt to be a language of his own that may not be understood by outsiders.

c. *Faulty Training.* The child's speech should be evaluated in terms of that of his parents and associates, for his speech patterns are apt to be similar to those of his family. In other words, he may have been taught to be a speech defective, and is then to be distinguished clearly from the child who develops a speech defect in a normal speech environment.

d. *Inadequate Discrimination of Vocal Sounds.* One attribute of good hearing is adequate sound discrimination, and proper vocal speech demands such sensory discrimination of the sounds that are heard and that are to be uttered.

A test of sound discrimination, devised by Travis and Rasmus, has shown that speech defectives without motor disturbances or disabilities possess inferior ability in speech-sound discrimination.

e. *Short Auditory Memory Span.* 'Auditory memory span' denotes the number of successive presentations given orally by the examiner that can be repeated correctly by the child. If a child is able to repeat without error one series out of three equal series of digits, consonants, or nonsense syllables given orally, the longest such series that he is able to reproduce correctly is accepted as his auditory memory span. The span is a function of age — 3 digits at 3 years, 5 at 7 years, 6 at 10 years, 7 at 14 years. The span for logical sentences is, of course, considerably longer than that for digits, consonants, or nonsense syllables. Many children with disorders of articulation have short auditory memory spans that appear to be factors in their speech defects.

f. *Incoördination of the Speech Muscles.* This factor may be cited here, though not strictly psychological. Very frequently the child with articulatory disturbances manifests inferior ability in controlling the lips, tongue, jaw, and diaphragm. The teacher ought to get some estimate of the amount of reduction in the child's motor coördination. The best way to do this is to record on a kymograph the movements under consideration. But since these instruments are frequently inaccessible to the classroom teacher, the rate and regularity of the movements of the various structures may be observed directly.

For the tongue, the child is asked to place it against a piece of paper held in his hand and move it backward and forward as rapidly and regularly as possible, taking care to keep it against the paper. By

comparing the child's performance with that of a child with normal speech, the teacher can determine any marked motor disability.

For the lips, the child is asked to move them as in whispering *p* or *b*; for the jaw, he is asked to raise and lower it as in biting; for the diaphragm, he is asked to pant. In all of these activities speed and rhythm should be emphasized. If the child's movements in these various activities are unusually slow, or jerky, or both, he probably has a motor incoördination that ought to be considered in the diagnosis of his speech difficulties.

### 5. Examining the Child's Speech

In examining the child's speech, the first task is to determine the nature and extent of the defect. The teacher's best tool is a trained ear. She should be able to detect abnormalities in the rate, rhythm, quality, and amount of speech by listening to the child talk. The examination should be based mainly upon unemotional spontaneous speech. She needs, however, prepared sets of examining material to cover all possible sound omissions and substitutions.

*a. Determining Understanding of Spoken Language.* Before the teacher can tell much about the nature of the child's defect, she must determine his ability to understand spoken language. In the case of the very young child this may be accomplished by having him point to various parts of his body and obey simple commands. A differential diagnosis must be made in cases who do not understand spoken language between deafness and the inability to understand or comprehend verbal expression with hearing intact. This can be made partly on the basis of the hearing tests already described. More complicated questions and statements may be put to the older child. The problem here is to determine the child's ability to comprehend the meaning of speech sounds in their commonly used relationships. No standardized tests exist relative to speech-comprehension at given age levels; the teacher will be obliged to use her own ingenuity to make this part of the examination as complete as possible. She may present orally materials within the child's grasp, and see how well he comprehends what has been read or spoken to him. Although this is a rough method, it will reveal any striking defect in the child's speech comprehension or listening ability.

*b. Examining Spontaneous Speech.* The spontaneous speech of the child may be studied in several ways. The child ought to be observed in ordinary situations in which he is not under any unusual emotional

strain. The situations ought to cover those in the home, in the school-room, and on the playground. By leading questions and remarks the teacher may direct the child's talk to cover as completely as possible the various sounds, sound blends, and sound combinations. By means of objects such as blocks and toys the preschool child's speech may be fairly well explored. Certain standardized situations have been developed to supplement these types of observation. They consist largely of presenting the child with a set of pictures or objects designed to call forth words containing all the consonant and vowel sounds and the consonant blends in their initial, medial, and final positions.

One form of such a test presents pictures to be named by the child; e.g., the Articulation Test I, devised by Miss Clara B. Stoddard, Supervisor of Speech Improvement Classes in the Detroit Public Schools. The child says the word suggested by each picture. A score sheet is devised to tabulate the child's errors or omissions. The difficulty with this particular test is that it does not furnish the teacher with an opportunity to observe the child's connected speech. He simply gives single discrete words in response to the presentation of single discrete pictures.

Another form of such a test, that of Blanton and Stinchfield,<sup>1</sup> consists of a number of fairly large objects that will elicit the desired sound. Forty-seven objects are used to call forth forty-eight responses containing the desired sound. The arrangement of the objects is such as to bring out the different sounds in the proper phonetic groups. Score sheets are provided for rating this test. The criticism offered in regard to the Stoddard test applies also to this test.

Another form of such a test, devised at the University of Iowa Speech Clinic, presents pictures in a story form. This offers a means for arousing the interest of the child in the task and assures a more nearly spontaneous speech. Score sheets are furnished to record the child's errors and omissions.

*c. Testing Oral Reading.* It is advisable to supplement the examination of spontaneous speech with an examination of oral reading. Materials of the proper difficulty for the individual's age and intelligence level should be selected.

Miss Stoddard has prepared two lists of short sentences which include all sounds. One list which has 45 sentences is called "Articulation Test II." The other list with 37 sentences is called "Articulation

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<sup>1</sup> Published by the C. H. Stoelting Company, Chicago, Illinois.

Test III." Each test is provided with a score sheet. Blanton and Stinchfield have prepared similar tests of oral reading. Their sentences contain all the sounds of English with a few consonant combinations. A score sheet is provided.

*d. Testing Repetitive Speech.* As a supplement to the testing of both the spontaneous speech and oral reading of a child, it is advisable to test his repetitive speech by having him recite material he has memorized. Mother Goose Rhymes are satisfactory material.

*e. Testing Ability to Imitate Speech Sounds.* It is essential to determine whether a child has defective speech because of carelessness or because of inability to produce correctly the various sounds. The careless child presents a problem entirely different from that of the real speech defective. In the former instance the teacher is dealing with bad habits; in the latter, with a specific disability. To distinguish between these two types we test ability to imitate speech sounds. If a child is unable to imitate speech properly when he attends strictly to its production, he probably presents a real speech disability. For this testing the teacher may use the reading material previously listed or nonsense syllables containing the various sounds.

From the results of all of these examinations, the teacher is in a position to undertake proper remedial measures. It cannot be emphasized too strongly that each child presents an individual case which demands individual consideration. The remedial treatment that follows will need modification to meet the demands of the given child.

## VII. TREATMENT OF ARTICULATORY SPEECH DEFECTS

It is as true of the treatment as it is of the diagnosis of speech defects that the child must be considered from every possible angle. The teacher should take the child for serious speech training only after he has been thoroughly examined by medically and psychologically trained workers.

Treatment will be discussed under three heads: physical treatment, psychological treatment, and educational treatment.

### 1. Physical Treatment

Many children with organic disease processes underlying their speech disturbances should be handled either entirely, or at least first, by the medical expert. Thus, too little nasality may be due to sinus infection, infected tonsils, enlarged turbinates, deviated septum, enlarged adenoids, growths in the nasal passages, or a combination of

some of these. Too much nasality may be due to cleft palate, post-operative tonsil trauma, post-adenoidal speech, velar insufficiency, or any combination of these. On the other hand, either defect may be the result of bad emotional reactions or bad habits.

Again, lisping may be due to missing teeth, harelip, lip paralysis, tongue-tie, abnormal tongue conditions, malocclusion, arched narrow palate, cleft palate, improperly formed dental arches, and paralysis of one side of the soft palate. Here the teacher should have the benefit of a medical and dental examination before corrective training is undertaken by her.

## 2. Psychological Treatment

Emotional maladjustments cause speech disorders and speech disorders cause emotional maladjustments. The emotional education of the speech defective should precede speech-training, though in the very young child speech reactions are more closely related chronologically to the concomitant emotional problems, so that his emotional and his speech development should be handled simultaneously.

## 3. Educational Treatment

*a. For Organic Defects.* In children with organic defects the speech teacher's task is made more difficult. The needed vocal structures are lacking or defective. It is futile to try to get some of these children to talk as normal children do; the goal should be to train the child so that he can make himself readily understood.

For weak and relaxed muscles (lips, tongue, soft palate) certain exercises may be found useful. Those in common use in speech correction are here described.

### *Tongue Exercises*

1. With the tongue pointed, move it outward and downward toward the chin.
2. With the tongue pointed, move it outward and upward toward the nose, touching the nose if possible.
3. With the tongue protruded between the lips, wag the tip up and down as rapidly as possible.
4. Rotate the tongue around the outside of the mouth in both the clockwise and counter-clockwise direction.
5. Protrude the tongue and form a groove through the center by raising both sides.

6. With the mouth wide open, curl the tip of the tongue back of the upper teeth.

7 Press the tip of the tongue against the back of the lower teeth until it rolls forward and outward between the upper and lower front teeth.

8 Move the tongue in and out of the mouth as rapidly as possible.

9 Press the tip of the tongue against the backs of the upper teeth until it rolls forward and outward between the upper and lower front teeth.

10. With the tongue pointed, dot the roof of the mouth in three places — front, middle, and back.

11 Scrape the roof of the mouth with the point of the tongue, going from front to back.

#### *Lip Exercises*

1. Protrude the lips in a puckered position.

2. Extend the upper lip outward and upward to touch the nose.

3. Pull down the lower lip, exposing the lower teeth

4 With teeth closed say *ah—oo-ee-oo*, *ah—oo-ee-oo* slowly and with vigorous lip action. Round the lips for *oo* and stretch them for *ee*.

5 With the teeth separated and with the mouth wide open, repeat the exercises.

6. Say *we-woe-we-woo*, *we-woe-we-woo* with exaggerated lip action. Be sure the lips are spread as in smiling for *we* and are rounded for *woo*.

#### *Soft-Palate Exercises*

1. Say *ah*.

2 Yawn (patient notes rising of palate).

3 Say slowly, emphasizing each sound, *ung-ah*, *ung-ah*, *ump-ma*, *ump-ma*.

4. Imitate the ringing of a bell, *ding-dong*, *ding-dong*, prolonging the *ng* softly.

5. Say *ing-ick*, *ing-ick*, prolonging the *ng* and making the *k* stop short and sharp.

The child with organic defects has to reorganize his speech apparatus. Speech structures that are not affected will have to serve in uncommon ways to assist in the tasks normally performed by the injured or missing structures. In addition to instructing the child how to place this, that, or the other part of the speech apparatus, the teacher should stimulate the child with speech patterns through the ear.

*b. For Other than Organic Defects.* In the child who has no determinable organic defects, the teacher's task is simpler. She should realize that a sound is the smallest possible unit with which to deal; it should not be broken up into the movements out of which one might suppose it to be built. She should realize also that a child learns better by hearing correct speech patterns than by drilling. The child's response may be considered helpful to the extent that its expression correctly repeats the stimulus.

The speech-defective child should therefore be subjected to properly timed and properly given stimuli. In his case the stimuli are sounds correctly given by the teacher. Our experience leads us to believe that a sound with which the individual is having difficulty should be produced for him by the teacher three to five times with about a second between each production. After a pause of a few seconds, the child may be asked to try to make the sound correctly. If he cannot, then the teacher should give the sound several times again, and so on, until the child can form the sound properly the first time. After he has given it once correctly, he may then repeat it. Drill, formerly thought to be the outstanding factor in learning, may act to sterilize the insight of the learner and to kill his interest in the task. We do not want drill words on which the speech defective stumbles, but stimulus words given by the teacher that he always hears accurately.

When working on one sound, it is not advisable to undertake work on another, particularly a similar one, until the child has had time to bring the first one to some degree of perfection.

In learning, perceiving the goal is important. A correct sound formation is not based upon an elimination of random movements or upon a successful combination of such movements, but upon an entirely new movement unit. The child should not think about the movements as such, but strive to perceive the goal, the end-product. At the outset, the goal (proper sound formation) may be vague; he may not be able to perceive a sound in relation to the means of producing it. He makes his initial move and immediately finds himself in error. But, as he improves by proper stimulation, the goal becomes clearer and finally he produces the desired sound correctly.

These suggestions for retraining do not rule out the advisability for calling the child's attention to obvious misplacements of the organs of speech. If a child is placing the tongue too far forward or too far up in his attempts to produce a certain sound, his attention may be called to the error. If he has a lazy jaw and a faulty *s*, he ought

to be taught that by lifting the lower jaw the s may be produced correctly. A good deal of ingenuity is required on the part of the teacher to motivate the speech defective. It is desirable that he do as much for himself as possible.

The whole instructional program should be set within the range of the child's experiences and level of maturity. The materials should be drawn from the daily experiences and activities of the particular child.

It is essential that the teacher gain the child's attention. To repeat nonsense syllables or words will not be adequate stimulation unless the child is in an attentive state of mind. The child should be taught to be 'ear-minded,' to be attentive to differences in sound quality, to hear the incorrect as well as the correct sound, and then to distinguish between them. He may first listen to the teacher, then to his own production of the two sounds. By listening to his own speech played back to him from a phonograph record, the child is made aware of his own speech abnormalities.

Stimulus material which appears in the form of nonsense syllables, words, and sentences designed to include the main sound blends and each sound in its three possible positions (initial, medial, and final) may be found in standard works in speech correction. The teacher gives these stimulus materials; the child watches and listens.

It is best not to change the vowel in the nonsense syllable, since he frequently gets confused in noting such a change, and to repeat the same syllable three to five times before he is asked to try it. The child should not use material for practice until he is able to sound it correctly.

### VIII. DIAGNOSIS OF STUTTERING

In treating the diagnosis of stuttering we shall discuss the significance of the various test scores and other types of information obtained in the clinical examination. By "diagnosis of stuttering" we mean a description and evaluation of a case of stuttering in terms of its symptoms, nature, and probable causes. The specific treatment in any given case is to be based upon the diagnosis.

In view of the conflicting opinions held by speech specialists in regard to the nature and treatment of stuttering, we have attempted to present a broad approach to the problems of diagnosis and management of the stuttering child. We have been impressed by the pluralistic causation of stuttering and the varying kinds of treatment that are

effective. The teacher should no longer work in terms of a single cause or of a single way of treatment.

### 1. The Case History

We shall note at the outset certain important considerations with regard to the family history.

First, the physical soundness of the stutterer's hereditary stock is indicated by the presence or absence of various defects and diseases in his family history. Generally speaking, a physically sound hereditary stock is more favorable to a satisfactory prognosis (chances of cure).

Second, the amount of left-handedness in the family background is of importance because left-handedness is to a significant degree hereditary. Generally speaking, a stutterer is more likely to possess native left-handedness if there is left-handedness in the family stock.

Third, significance is to be attached to the presence of stuttering in the hereditary background. It is very doubtful that stuttering, as such, is hereditary, but it is very probable that the physical predisposition for stuttering is in large measure hereditary. The presence of stuttering in the family background, therefore, tends to indicate the possibility of a biological basis for stuttering in the individual being examined.

In the stutterer's personal history are also aspects of special significance.

First, a history of birth injuries, pathology during the prenatal period, cyanosis (blueness of the body), difficulty in initiating breathing, and other pathological conditions at birth is not favorable to a satisfactory prognosis, though not cause for discouragement.

Second, the early physical development of the individual is indicative of the kind of organism with which he began life. Retardation in learning to walk, talk, sit up, and to perform other motor activities is generally indicative of a basis for stuttering later.

Third, serious diseases, especially those involving prolonged high fever and definite injury of the nervous system, must be taken into account.

Fourth, it is desirable to know fully the development of the stutterer's handedness, though it is difficult to obtain this information. A history of original left-handedness is usually reliable. If 'no left-handedness' is reported, the report may or may not be accurate.

Most parents have failed to make adequate observations and take

it for granted that their children are right-handed. Moreover, it is easy to train a very young child to be right-handed, unless the child happens to be strongly left-handed at the start.

Fifth, it is important to know whether or not the child's speech was well developed before stuttering began. Generally, when speech development is slow, that suggests a deep-seated basis for stuttering.

Bilingualism (the use of two languages) may be found a factor in stuttering.

If a child learns two or more languages simultaneously, particularly before any one language has been firmly established, he is more apt to stutter.

Sixth, the development of the stuttering itself is of outstanding importance. It is desirable to determine exactly the age of onset of the disorder. If stuttering began, as is often the case, as soon as the child started to talk, one can at least be certain that he was strongly predisposed to stutter. If the child used normal speech for a time, one can at least be certain that he was born with potentialities for normal speech. The severity of the stuttering from year to year reveals the extent of the stutterer's disposition to outgrow the disorder. If there has been significant improvement in the past two or three years, one may hope that the stutterer will outgrow the disorder without recourse to strenuous treatment. It is essential to examine closely the conditions surrounding the onset, in order to detect possible causative factors. The nature and outcome of previous treatment should be considered in outlining the therapy.

The seventh point to be considered is the stutterer's present condition with regard to physical health, personality make-up and mental condition, and the severity of his stuttering. Recommendations regarding physical and mental hygiene as well as other phases of the treatment will depend in some measure upon the facts thus obtained.

## 2. General Physical Health

In addition to the case history the teacher needs such helpful information in regard to the physical condition of the stutterer as might be obtained from a thorough-going physical examination. If the stutterer is easily fatigued, cross and irritable, she should suspect the necessity of a careful check-up on the stutterer's general physical condition. Specific dietary and nervous troubles should be treated by the physician.

### 3. Psychological Factors

In many schools the teacher can obtain the stutterer's scores on mental tests. If the teacher must do the mental testing herself, she will use such tests as her training and equipment warrant.

It is desirable to ascertain whether the stutterer is defective in any linguistic function other than oral speech. For this purpose numerous standardized tests are at hand for reading, writing, and spelling.

Another phase of the mental examination should cover the personality of the stutterer. The stutterer's total behavior during the interview indicates much in the way of underlying attitudes and habits. Through continued association with him, the teacher will have abundant opportunity to appreciate more and more fully his motives and point of view. Aside from such observations, there are techniques described elsewhere in this Yearbook that may be used.

The teacher may supplement all these approaches to the study of the stutterer's personality by having him write his autobiography. This gives the teacher the opportunity to put herself in the stutterer's place, to appreciate and comprehend his point of view and his general philosophy. It will often tell the teacher what rôle stuttering has played in the stutterer's life and in the development of his personality. In his autobiography, the stutterer can begin with his family and the home in which he was born. He can tell of his life in infancy as far as it has become known to him. Then he can pass on to his earliest memories and follow a rough chronological order in reciting the events and thoughts that make up the story of his life. He should include his first experiences of stuttering, the development of his attitudes toward it, and the part it has played in his life as he sees it. The autobiography has a certain therapeutic value, in that it gives the stutterer a certain insight into his own life which he might not otherwise obtain. We shall discuss this later.

### 4. Handedness Factors

Since handedness may be related to stuttering, it is advisable for the teacher to examine the handedness of the child. Some of the better tests of native handedness are too technical to be administered by the teacher. However, there are a number of special observations of handedness or sidedness that the teacher can make.

1. Play ball with the child, observing which hand he uses more in throwing, rolling, picking up, and catching the ball.

## DIAGNOSIS IN SPEECH

2. Measure the strength of grip in each of his hands, using a dynamometer.

3. Scatter a number of matches on a table directly in front of the child and tell him to place them all in a neat pile. Observe which hand he uses to pick up the matches and which hand he uses to place them in the pile. Repeat, scattering the matches in front of him but toward the left; and again, scattering them in front of him but toward the right.

4. Give the child a piece of candy wrapped in paper and see which hand he uses the more in removing the paper.

5. Have him draw a picture of a cow, horse, or pig and observe whether he draws the animal in such a way that it faces toward the left or toward the right.

6. Place a pencil and a piece of paper directly in front of him and tell him to show you how well he can write. Observe which hand he uses. Notice especially whether he shows any tendency to write mirrorwise, backwards, or upside down, or whether he has any peculiar way of gripping the pencil. Is his muscular coördination good? Have him write with his other hand. Compare the writing of one hand with that of the other.

7. Have him put peas or pebbles in a small-necked bottle, and have him empty the bottle into his hand. Observe which hand picks up the peas, which places them in the bottle, and which shakes the bottle in emptying it.

8. Have the child stand with his back against the wall and, with his heels together, step away from the wall. Observe which foot he moves first. Repeat several times.

9. Hold a piece of candy or other attractive object above the child's head and observe which hand he uses the more in reaching.

10. Place a small flicker top in front of the child and have him spin it. Note which hand is preferred in several trials.

11. Have the child spoon sand by means of a tablespoon from a pint sand-bucket into a small metal container. Note which hand is preferred for the spoon.

12. Have the child pound on a wooden block with a small wooden hammer. Note which hand holds the hammer in several trials.

13. Have the child shake a highly colored celluloid rattle with a musical clang. Note which hand holds the rattle in several trials.

14. Note which foot is used by the child in kicking a small rubber ball.

15. Make a half-inch hole in a sheet of paper of 'typewriter size.' Have the stutterer stand ten feet from you, hold this paper with both hands at arms' length in front of his face, and, with both eyes

open, look through the hole at the bridge of your nose. Now, have the stutterer lower the paper, still holding it at arms' length, then have him bring the paper up again to the level of his eyes and once more look at the bridge of your nose through the hole. Have him lower the paper again. In this manner, have him look at you five times, lowering the paper after each trial. Next have him repeat this procedure five more times, holding the paper in the right hand at arms' length and bringing the paper in from the right. Next have him repeat the procedure again five more times, now holding the paper in the left hand and bringing it in from the left. Record the number of times the stutterer sights with his left, and the number of times with his right eye. Notice also whether he shows any confusion or uncertainty. The child is considered right-eyed or left-eyed if he uses the former or the latter eye eighty percent of the time. Left-eyedness is indicative of left-handedness, right-eyedness of right-handedness, and a lack of a clean-cut choice of one eye as a confusion in handedness.

### 5. Examining the Stutterer's Speech

There are three phases of stuttering; the prespasm, the spasm, and the postspasm.

a. *The Prespasm.* The prespasm phase may be regarded as having a duration as short as a fraction of a second or as long as a week or more. Let us make this clear.

Suppose a stutterer faces the necessity of calling upon a new employer two weeks hence. He may begin at once, and continue at intervals for two weeks, to worry about this interview. Whenever he experiences such worry, there take place in him certain bodily changes, such as increase of muscle tension, increase of heart rate, changes in rate of breathing, and perhaps changes in glandular activity. These changes in his condition are related to his stuttering; they influence the frequency and intensity with which his stuttering spasms occur; but they are not an integral part of the stuttering spasm itself.

Now, let us suppose that the stutterer looks forward to the interview with no trepidation whatever. May we speak of his calm mental state and bodily condition as characterizing the prespasm phase of such stuttering as may occur in the forthcoming interview? Certainly. *We may define the prespasm phase of stuttering as the stutterer's reaction to an impending or possible stuttering spasm.* The two things about this prespasm reaction that make it extremely important are: first, it conditions the frequency and intensity with which stuttering spasms occur; second, it can be modified.

We have discussed the prespasm phase as having a duration of two weeks. We may as readily regard it as having a duration of a fraction of a second. Its duration is not its most important attribute. Whatever its duration, the essential fact about it is that it is the stutterer's reaction, psychological and physiological, to a stuttering spasm that has not yet occurred, but which he expects to occur or thinks might occur.

The clinician or teacher is to make thorough observations of the stutterer's prespasm reactions, in order, first, to estimate the part played by the prespasm reactions in determining the severity of the stutterer's speech disorder; second, to plan for modifying the prespasm reactions.

What, then, is the teacher to look for in making these observations? First, what is the stutterer's attitude toward his stuttering? Does he regard it as a disgrace? A mark of grave inferiority? A stifling frustration? A social, or vocational, or educational handicap? A mere inconvenience? Simply a characteristic? An object for scientific research and candid study, rather than a reason for discouragement and shame? An advantage in certain respects? Obviously, his attitude determines in large measure the way in which he reacts — whether by shame, fear, dread, indifference, curiosity, objective self-scrutiny, or what.

Second, to what degree is the stutterer willing to go ahead and stutter? If he is exceedingly unwilling to reveal his stuttering, he will have great dread and fear of an impending or possible spasm and will show considerable emotionality and violent bodily changes in his prespasm reactions.

*b. The Spasm.* The second phase of stuttering is the spasm phase. It consists of incoördination of the speech muscles — muscles of the lips, tongue, jaws, pharynx, larynx, chest, abdomen. As has already been pointed out, this incoördination — the spasm itself — is affected by the stutterer's prespasm reactions; it is affected also by his postspasm reactions. It is for the clinician or teacher to estimate the degree to which the spasm is purely neurological and physiological and the degree to which it is aggravated by psychological factors — a difficult thing to do.

The teacher is to be warned with greatest emphasis against jumping to conclusions too hastily and against placing too much emphasis upon any one aspect of the stutterer's speech disorder.

*c. The Postspasm.* The third phase of stuttering is the postspasm

phase. ‘Postspasm’ does not exactly mean ‘after the spasm’; it means ‘after the *beginning* of the spasm.’ That is, the postspasm phase consists of the stutterer’s reaction to a spasm that has actually begun and is really occurring. Of course, the stutterer may react to a spasm that has ceased to exist; that is, he may look back on it, regret it or laugh about it, but we are not concerned with the stutterer’s memories of that sort. We are concerned with what the stutterer thinks, feels, and does about a spasm that he has to contend with here and now.

What is his attitude toward it? This is the most significant aspect of his postspasm reaction, just as it was of his prespasm reaction. If the stutterer regards his existing spasm as shameful, disgraceful, socially undesirable, he will dread its continuation. He will react by trying to stop the spasm as quickly as he can — to stop it, if possible, *before his listeners notice it at all*. He will make an effort to cover up the spasm. When the stutterer makes this effort, expends energy, indulges in muscular strain, he is actually trying to do the, for him, one all-important thing: to conceal his spasm, to appear as a normal speaker, to talk in such a way that no one will notice his spasm.

It is difficult for the normal speaker to grasp this fact, to understand that at the very time that the stutterer is gasping and grunting, making facial grimaces, straining — making his stuttering, thereby, very conspicuous — he is really doing all these things for the purpose of *hiding* his stuttering! But it is necessary to understand clearly that the stutterer is not trying merely to ‘force out’ the sound; he is trying to be quick, to work fast, to force out the sound before anyone has time to catch him doing it. Of course, he fails more often than he succeeds; that is as obvious to the stutterer as it is to his listeners. But that is beside the point. He believes stuttering to be undesirable and takes it for granted that he must always try — even though he always fails — to keep from stuttering or to keep others from noticing it.

Besides making careful observations of the stutterer’s attitude, the clinician should observe also the nature of his postspasm reaction in terms of motor response; that is, the extent of his muscular strain should be appreciated. The form of that strain should be noted — in facial grimaces, protrusion of the tongue, holding the breath, sounds emitted, etc. If there were no strain at all there would probably be very few tonic spasms. There would probably be no ‘stammering,’ as the long tonic blocks are sometimes called. There would probably be only clonic spasms — that is, loosely, fluently, easily repeated sounds

like *th-th-th-this*. For purposes of examination, the extent to which the individual's disorder appears to be 'stammering' rather than stuttering probably indicates well the extent to which he is reacting to the spasm with effort and strain.

Certain observations should be made of the non-stuttering aspects of the stutterer's speech. The rate of talking, the rhythm of non-stuttering speech, and the general effectiveness of the stutterer's speech should be noted. Observations should also be made concerning the stutterer's voice — its pitch, volume, expressiveness, and quality.

## IX. THE MANAGEMENT OF STUTTERING

Treatment must be based upon the full consideration of all of the pertinent information revealed through a thorough-going examination. No single test-finding and no single aspect of the case history is to be emphasized to the exclusion of other pertinent matters. The inexperienced clinician should seek the coöperation of a competent speech pathologist.

### 1. Physical Hygiene

The teacher's first duty is to coöperate with the proper authorities (physician, nurse, parents) in getting and keeping the stutterer in the best possible physical condition. In some cases no instructions regarding stuttering should be given until the effect of proper physical hygiene has been observed. In some cases emotionality and maladjustment are in large measure the expressions of physical ill health. For example, if a stutterer has a thyroid disturbance, it would be almost pointless to attempt any treatment of his stuttering until he has received adequate thyroid treatment.

When a stutterer is fatigued or ill, he cannot concentrate or think as well as he usually can, and his stuttering is worse. After all, most stutterers, like most non-stutterers, are usually in fairly good health. Like most persons they need to be urged to follow well-known rules with respect to sleep, exercise, diet, etc.

### 2. Mental Hygiene

In its general aspects, mental hygiene for the stutterer is the same as mental hygiene for anyone else. Its primary objective is insight on the stutterer's part, insight into himself, his motives, his behavior, the trend of his development, and the relationship in which he stands to persons around him.

It may be said properly that mental hygiene for the stutterer begins with mental hygiene for the clinician. We want to emphasize this for all it is worth, because the very success or failure of mental hygiene for the stutterer hinges on this fact. If you believe that mental hygiene is desirable for others, but unnecessary for you, there is slight possibility of your helping the stutterer through mental hygiene.

In applying mental hygiene, whether to yourself or the stutterer, there are certain 'rules of the game.' Perhaps the most important of these is frankness—uncompromising, unwavering frankness. We warn you that this is amazingly difficult. Mental hygiene is by all odds the most difficult part of the treatment of stuttering—because it requires a degree of frankness and mental balance of which most people are incapable under ordinary circumstances.

Before discussing the specific methods of mental hygiene, we want to state a general principle which we believe should underlie all such specific methods. It is this: *personality development is a matter of learning.* Of course, it involves hereditary potentialities, environment, and physical health. But for practical clinical purposes, it had best be regarded as a matter of ordinary learning.

a. *The Lecture Method.* Perhaps the most commonly used mental hygiene technique is the ordinary lecture. As a rule, the lecture is addressed to a group of individuals. The most important thing about the stutterer, from the point of view of the mental hygienist, is the way in which the stutterer defines his own stuttering in social, vocational, and personal terms. The stutterer should be helped to understand clearly and fully just what his attitude is in this regard, how it developed, and upon what it is based. He needs to know as much about stuttering, especially his own stuttering, as he is able to learn. He must replace or supplement his childish observations and attitudes with 'adult,' objective, matter-of-fact observations and attitudes.

We have found that the lecture method is particularly suitable in connection with regularly scheduled classes for stutterers. Along with the mental hygiene lectures much other work can be done in such classes.

b. *The Interview, or Personal Conference.* The interview is more intimate and in many respects more effective than the lecture method. It affords the clinician an opportunity to become more intimately acquainted with the individual stutterer's problems and needs, and the discussion can be readily adapted to the stutterer's most pressing needs.

*c. Readings.* In some cases, it is advisable to ask the stutterer to read books and articles especially pertinent to his specific problems. A great deal of care should be exercised in assigning such readings.<sup>1</sup> One should respect the old truism that a little learning is a dangerous thing, for this is especially true with regard to such a subject as mental hygiene.

Whenever readings are assigned, the clinician should take the responsibility of clearing up any confusion that the impact of new ideas may cause in the stutterer's thinking.

*d. The Project Method.* By the 'project method,' we mean the study of one's specific problems as well as the learning of specific forms of social adaptation. We shall discuss first the study of one's specific problems.

(1) As already noted, a very common problem among stutterers is that centered around the stutterer's attitude toward his defect. In many cases this can profitably be regarded as the subject for a study project. In carrying out such a project, the stutterer should approach the study of his attitude toward stuttering in the same spirit of scientific and scholarly interest with which he might approach the study of such an impersonal subject as the tariff policy of the United States government. He should use the fact-finding technique so familiar to every research worker and student. He should acquire as much information as possible regarding the origin of his attitude, the factors that have influenced its development, and the forces that now determine its nature. The objective of such study is insight that will enable him to change his attitude in a desirable direction.

The specific problems chosen for mental hygiene projects will vary from individual to individual. We might mention one which has been common to many of the stutterers whom we have studied. It has benefited many of the stutterers to analyze the differences between those situations in which they experience more, and those in which they experience less, than the usual amount of embarrassment from

<sup>1</sup> The following, chosen from a number of valuable references, may be found useful: *Principles of Abnormal Psychology*, by Edmund S. Conklin (Henry Holt); *The Psychology of Abnormal People*, by John J. B. Morgan (Longmans, Green); *The Psychology of Insanity*, by Bernard Hart (Cambridge Press); *Outlines of Psychiatry*, by William A. White (Nervous and Mental Disease Publishing Company); *The History of the Person*, by John M. Dorsey (Longmans, Green); *Because I Stutter*, by Wendell Johnson (Appleton-Century); *Influences of Stuttering on the Personality*, by Wendell Johnson (University of Iowa Publications in Child Welfare).

stuttering. The intensive study of this problem often results in a gratifying degree of self-understanding.

(2) The second general type of problems which may be attacked by means of the project method are those centering around specific forms of social adaptations. These problems fall mainly under five main heads.

First, there is the problem of *the telephone*, which is a common one among stutterers. We have found it beneficial to stutterers to carry out the following project. We first explain to the individual the general principles underlying the construction of the telephone and the main purposes for which the telephone is used. We then have the stutterer make a list of 'telephone situations' easy to handle. He practices with these easy situations until he becomes thoroughly accustomed to using the telephone. He then selects other telephone situations that are a bit more difficult for him and practices these until they become easy to handle. In this manner, he gradually increases the difficulty to be met until he acquires a general proficiency in using the telephone. We may call this general technique the 'graded project method.'

A second and common problem among stutterers is that of *ordinary conversation*. In dealing with this problem, it is well to adopt the point of view that the stutterer finds conversation difficult, not because he is inherently unable to handle conversational situations, but because he simply does not know how to handle them. He has never learned how to converse. To a large extent he has avoided such situations, and thus has had too little experience with conversation. As with the telephone problem, we assign a graded project. He begins with one or two persons with whom he finds conversation enjoyable and gradually goes on to less familiar and more difficult conversational situations. In carrying out such a project as this one, keep in mind that nothing succeeds like success and that nothing fails like failure. Assign situations in which the stutterer can be expected to converse with a satisfying poise and pleasure. The more situations of this kind he meets, the more eager he will become to meet other situations.

A third, closely related problem is that of *oral recitation and public speaking*. The stutterer should not recite orally in the classroom unless he volunteers. This policy should be fully explained to him; otherwise he will be under a constant emotional tension, expecting to be called upon to recite at any moment. The stutterer who has the more objective attitude toward his defect will volunteer to recite

more often than will the stutterer who is extremely sensitive. For this reason, a great deal can be done to increase the stutterer's ability to recite orally and to speak in public through changing his attitude toward his disorder. To supplement this approach to the problem, however, the graded project method should be used. The stutterer should be given oral recitation assignments that are extremely easy for him to manage, and he should then proceed by very gradual steps to more difficult assignments. The stutterer's participation in our speech clinic classes is a good form of practice in oral recitation.

As far as the stutterer is concerned, the chief difference between oral recitation and other forms of public speaking is that the latter are generally more difficult, cause more embarrassment and general emotionality. As a rule, a stutterer has had very little experience in public speaking; he needs to be told how to organize a speech, how to face an audience, and how to deliver a speech. Then he should be given opportunity to acquire experience in public speaking, preferably in a speech clinic class. He should proceed by gradual steps to difficult speaking assignments. The following eight types of assignment are useful:

1. Speaking a single sentence without standing to face the audience.
2. Speaking a single sentence while standing before the audience.
3. Answering a question put to him by a classmate and in turn asking a question of another classmate.
4. Making a one-minute, organized speech without standing to face the audience.
5. Making a one-minute speech while standing before the audience.
6. Making longer speeches.
7. Reading aloud.
8. Dramatic reading.

The fourth problem of social adaptation common to stutterers is that of *meeting routine speaking situations* in connection with shopping, asking for information, making introductions, and the like. This problem may be dealt with by means of the graded project method.

Fifth, stutterers commonly experience difficulty in meeting *formal social situations*, such as dances, parties, and other formal social functions. As a rule, they are hardly in a position to benefit very much from experiences in these matters until their attitudes have been changed sufficiently to develop a fair degree of self-possession. Once

they are prepared to profit from these experiences, they should be encouraged to attend formal social functions, in order that they might learn how to meet the situations involved. The principle of the graded project method should be followed in this connection also.

*e. The Autobiographical Technique.* We shall only add a few remarks to what we have already said concerning the autobiography. The stutterer should use his autobiography in essentially the same way he would use a textbook. He should study it, criticize it, outline it, master it. He should be examined over it. It is especially beneficial for him to identify in his own life-story the origin and history of his attitude toward stuttering and the specific influences that stuttering has had on his attitudes. He will find it to his advantage to read the autobiographies of other persons, especially of other stutterers.

In general, the autobiographical technique is most suitable for those stutterers who are unusually sensitive, discouraged, or bitter about their stuttering.

*f. Psychoanalysis.* Whenever psychoanalysis is used for stutterers, it should by all means be carried out only by a competent psychoanalyst. We regard psychoanalysis, not so much as a method of treating stuttering, as we do a psychiatric technique for the reeducation of psychoneurotic and definitely maladjusted individuals.

*g. The Use of the Mirror.* Two purposes are served by having the stutterer speak before a mirror: first, he can compare various ways of reacting to the stuttering spasm; second, he can become more fully accustomed to his own speech. At first the stutterer should practice speaking before a mirror in private; later with other stutterers, with normal speakers, and with the speech-correction teacher.

*h. Setting an Example.* The speech-correction teacher is an important part of the stutterer's environment. The teacher must exemplify the well-adjusted, well-developed personality.

The teacher must also have a great deal of empathy for the stutterer, must be able readily to put herself in the stutterer's place, experience what he experiences as a stutterer surrounded by normal speakers. In this connection, we advise the teacher to imitate the speech of a stutterer as nearly as possible in various speech situations.

### 3. Changing Handedness

The diagnosis of the stutterer may indicate the advisability of a shift from the right to the left hand or the still further development

of the left-handedness or right-handedness already present. In general, a child should be shifted to the left hand if he gives a history of having been left-handed in childhood or if the various tests indicate that he possesses a large degree of either left-handedness or confusion in handedness (ambidexterity). There are four general ways to develop left-handedness: improve left-handed skills already present; develop new left-handed skills; keep the left hand active as much of the time as possible, preferably at skillful activities; avoid the use of the right hand except whenever it is absolutely necessary to use it. These four ways will now be described.

*a. Improving Left-Handed Skills Already Present.* There are probably no left-handed individuals who have developed the strength and skill of their left hands to the fullest degree. There are no right-handed individuals — except those whose left hands are missing or disabled — who have no left-handed skills whatever. Therefore, if the stutterer is to become left-handed, his first task is to recognize and improve the left-handed skills he has already acquired. This is the easiest step. These skills should be studied, ways of improving them should be decided upon ; then they should be practiced diligently.

*b. Developing New Left-Handed Skills.* The teacher and stutterer should observe left-handed persons in action: left-handed athletes, writers, workmen, persons who perform routine activities with the left hand. They should observe these persons studiously, analytically, and with empathy. In practicing left-handed activities, it is well to imitate left-handed persons who are very skillful.

(1) *In Writing.* Methods and practice materials used for teaching penmanship to the right-handed person may be used for teaching penmanship to the left-handed person — with two exceptions.

First, the paper must be placed in front of the left-handed writer in approximately the same relationship to his left arm and hand as it is to the right arm and hand of the right-handed writer. Left-handed persons who write with the arm twisted in such a manner that the writing hand lies above the line of writing often say that they developed this style of writing because their teachers insisted that the paper be placed for the left-handed writer exactly as it is placed for the right-handed writer.

Second, it must be remembered that the writing movements of the left-handed person are, in one sense, opposite to those of a right-handed person. On all upward and forward strokes the right-handed writer moves the pencil away from the mid-line of his body, while on all

downward and backward strokes, he moves the pencil toward the mid-line of his body: the left-handed writer does the opposite of this.

This fact is of fundamental importance in teaching the left-handed person how to use arm movement, to execute the basic writing movements, and to give a forward slant to the letters. Otherwise, he will probably find arm movement difficult and will tend to develop a back-hand slant.

The stutterer is to speak each word aloud as he writes it. It is very important that he begin the writing movement first and that he speak the word immediately after he has begun the writing movement. The aim is to coördinate the movements of the arm with those of the speech muscles in time as well as in space. Moreover, it is important that both patterns of movement be executed with the greatest possible skill and exactness. The handwriting should never be careless, and the stutterer should never mumble the words in speaking them aloud. Handwriting is an extremely delicate skill if it is done with diligent attentiveness at all times. If it is not done in this way, it is much less valuable as a therapeutic technique.

(2) In Shorthand. The standard shorthand manuals can be used by the left-handed writer. Shorthand is based on a forward-flowing movement with very few backward strokes, and is as readily mastered by the left-handed writer as by the right-handed writer.

For purposes of therapy, left-handed shorthand offers many advantages. In the first place, it is a language skill. More than that, it is a skill which has not been learned (in most cases) through the right hand. It involves extremely rapid expression of language through the writing hand. Also, the learning of shorthand with the use of a standard textbook proceeds by definite and orderly steps, and this makes it comparatively easy to teach. The progress to be observed as the course is pursued is a very strong motivating factor. Not the least of the advantages of shorthand is the fact that it can be used in many cases for practical purposes, such as note-taking in school. It may even constitute preparation for a profitable vocation.

The speed and precision of movement demanded is of great importance, because the building up of cerebral dominance through the use of the left hand requires the development and exercise of a very high degree of sheer skill.

As in longhand writing, so in shorthand the words should, if possible, be said aloud as they are written and the speaking and writing should be coöordinated with great precision. The words should be

spoken distinctly, never mumbled, although they need not be spoken with unusual loudness.

(3) In Throwing. Throwing, when properly done, is a skill of the highest order. Good form, accuracy, unerring control are the goals to be kept in mind always in learning to throw with the left hand. *Always throw at a target.* Aim first of all to develop rhythmical co-ordination of the whole body in throwing. Make the movement of the throwing arm merely one part of a total bodily movement. Study the form of a good left-handed baseball pitcher, and try to adopt as much of his style as possible. Strive always for perfect control—try always to hit the target, not to develop speed or distance.

(4) In One-handed Games. There are a number of one-handed games that are useful for the purpose of developing left-handedness. Among the best of these are ping-pong, tennis, horseshoes, baseball, jackstones, and quoits.

In learning these games, the stutterer should, first of all, observe left-handed players and get as much instruction as possible from them. He should strive for good form; coöordinated movement of the whole body; proper coöordination of wrist, elbow, and shoulder; and precision of movement. Speed will come later.

(5) In the Use of Common Tools. There are certain household tools that practically everyone uses. The stutterer who is shifting to left-handedness should learn to use these tools with the left hand. Of chief importance are scissors, pliers, screw driver, hammer, and knife. Specially made left-handed scissors can be obtained through any hardware dealer, and should be obtained if possible. The stutterer should acquire skill in the use of these common tools as quickly as possible. In this connection, it is especially important to develop properly the use of the wrist.

(6) In Routine Activities. The stutterer who is learning to be left-handed should master as soon as possible those everyday activities, such as eating, shaving, combing the hair, brushing the teeth, dressing, scratching matches, handling objects, opening doors, and all of the other routine activities that require the use of the hands. Many of these activities require the wrist action to a high degree. Unless one cultivates this wrist action, one will be very awkward, especially in eating, combing the hair, and brushing the teeth. It should be made clear that eating with the left hand is in no sense a breach of etiquette.

(7) Some General Considerations. The learning of skills with the left hand requires an enormous amount of highly conscious, intelligent

practice. Practice in the sense of mere repetition is not enough. With practice there must be analysis, thought, and insight into the nature of the task to be mastered and into the way in which mastery is to be achieved. Practice without understanding is an obstacle to real education and skill. Often it leads to no learning at all, and often it leads to error!

It should also be said that the left-handed learner should distribute practice in such a way as to provide for a variety of tasks. He should not spend an entire day practicing only handwriting — although he should spend more time on handwriting than on any other one thing. Some of the time should be spent on the practice of shorthand, throwing, drawing, ping-pong, the use of scissors, tennis, etc. When practice is thus distributed among several skills, it is practically impossible to practice too much.

c. *Keeping the Left Hand Active.* When the stutterer is not indulging in definite practice, he should keep the left hand active as much as possible. He should find ways to keep his left hand active much of the time, preferably at skillful activities. His problem is to become left-handed, and he cannot do that without using his left hand a great deal.

One matter deserves special mention. Some stutterers say that they are engaged in work which requires the use of the right hand. One stutterer who was a radio engineer insisted that the building and repairing of radios demanded such fine hand work that he had to use the right hand rather than the left. Another, who was an art student, declared that he could not paint with the left hand. Now, the fact is that there is no skill so delicate that it cannot be learned through the left hand, especially by a person who is naturally left-handed. Moreover, the stutterers engaged in doing fine hand work, like the radio engineer mentioned, are the very ones who — by tolerating a week or two of awkwardness — have the best opportunity to develop a high degree of fine skill in the left hand. What they cite as an alibi is really an unusual chance to develop the left hand intensively.

d. *Avoiding the Use of the Right Hand.* In learning to be left-handed, it is very important that one avoid any unnecessary use of the right hand. One should observe truly left-handed individuals and note that their right hands are comparatively inactive. If one is to become thoroughly left-handed, it is essential, not only that left-handed habits be acquired, but also that right-handed habits be discontinued. The strength and skill of the right hand should be reduced,

at least to the degree that there is superior strength and skill in the left hand.

The stutterer may learn to use the left hand and to avoid using the right hand by 'thinking left-handed.' We should instruct him: "When you imagine yourself writing, think of yourself writing with the left hand. When you approach a door, think of yourself opening it with the left hand. When you think of yourself playing baseball, imagine that you throw and bat left-handed. Think about your hands as a left-handed person would. If you do this, you will find that it will become more and more natural for you to use the left hand."

Some persons, however, seem unable to think left-handed; perhaps it would be more correct to say that they seem unable to remember to use the left hand. We refer to young children and to adults who have low mentality or who are not given to following instructions. In training such persons to become left-handed, it is wise to immobilize the right hand so that they cannot use it.

The best way to do this is to have a physician put a light plaster cast on the right hand and forearm, extending from about the middle of the forearm to the finger tips, but without being closed over the finger tips and leaving the thumb free.

Such a plaster cast is perfectly safe when applied by a physician. It should be removed after about three weeks; then, after two or three days, a new cast should be put on. This should be repeated until the person has acquired left-handed habits. This plan is very successful, especially with children who could not be induced otherwise to use the left hand.

It will occur to many persons that the stutterer might wear a glove, or keep his arm in a sling, or even in specially made leather or cloth wristlet. We have found that the plaster cast is preferable—chiefly because it cannot be removed at will and prevents more thoroughly the use of the right hand.

#### 4. Principles of Speech-Training for Stutterers

In a general sense there is no difference between the principles of speech-training for stutterers and those for normal speakers. However, for stutterers more emphasis needs to be placed upon certain principles, because the stutterer has speech problems particularly related to his stuttering.

*a. The Development of an Objective Point of View.* The stutterer should realize that he is a stutterer, should admit it, and should in no way attempt to conceal the fact from his auditors. He might

even stutter early in his talk or tell his audience immediately that he is a stutterer and that, sooner or later, he may stutter.

*b. Learning to Stutter as Well as Possible!* The average stutterer should realize that his choice is not between stuttering and not stuttering, but rather between what we might call 'good' stuttering and 'poor' stuttering. We mean that he should try to eliminate all associative movements, such as extra sounds, facial grimaces, jerking his head, snapping his fingers, and contorting his body. Further, we mean that the stutterer should keep from distorting his sentence structure, from substituting one word for another in the attempt to avoid stuttering.

*c. Learning to Share Himself with Others.* The stutterer should take his listeners into his confidence, so to speak, and become one of them, rather than adopt the attitude of self-concern. He should talk and act more, and should think and feel less about himself. "The best (the most glib) speakers are not thinking while they are talking. The best (the most thorough) thinkers are not talking (acting) while they are thinking. In managing the stutterer, it is not a sound basic plan to make him think more. *The direction of management should be towards making him act more and think less.*"<sup>1</sup>

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<sup>1</sup> J. M. Dorsey, "The treatment of the person who stutters" *Mental Hygiene*, 18: 1934, 409-430.

## CHAPTER XX

### VOCATIONAL INTERESTS, ABILITY, AND APTITUDE

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The alluring vision of finding some magic device to determine for doubting youth what vocation to choose with greatest prospect of success has come down to us from time immemorial. The three decades that have passed since the coming of mental tests, despite all that tests have taught us of their limitations, have failed to dispel this ancient urge. The pressure for an answer is so great — the notion that somehow, somewhere, there must be a neat little instrument that will give the answer is so enticing — that too often wish-fulfillment has been mistaken for scientific fact. Thousands of tests have been given for this alleged purpose, but meanings that do not exist have been, it is feared, frequently read into results. Our experience with mental measurements has taught us with certainty, if it has taught us anything, that there is no single test or similar device, except in the minds of astrologers and fortune-tellers, that can answer so broad and complex a question as what vocation to choose.

Techniques of diagnosis and prediction in the vocational field involve the same basic principles as those in the academic fields. What is worse, they demand also analysis and measurement, not only of the mental and manual traits of the individual but of *vocational opportunity in the world as well*. And in this financial depression it should be unnecessary to emphasize that it is the latter that presents by far the greater difficulty. General academic, mechanical, or social aptitude can be broadly inferred on the basis of an adequate school history of the pupil and of his interests as expressed there. And it is quite possible through suitable tests to obtain fairly meaningful measures of a pupil's mechanical, academic, or social aptitude. But these inferences and measures do not in themselves afford a solution to the problems of vocational guidance; they are but instruments to be used in the attack. The solution of the problems of guidance involves far more. It involves so great a complexity of infinitely variable factors,

both in the individual and in the practical world into which he is projected to take his place, that intelligent counsellors have long since ceased to assume that a youth in the junior high school, for example, can possibly be told with any degree of certainty in what vocation he will be most successful when he reaches maturity. Guidance has become largely confined to educational guidance — and through this, vocational guidance may more often be indirectly implied than directly forecast.

## I. THE PREDICTION OF VOCATIONAL SUCCESS: THORNDIKE'S INVESTIGATION

### 1. The Purpose and Method

One of the most substantial researches that have been made in the field of diagnosis and the prediction of vocational aptitude is that conducted by Dr. Edward L. Thorndike and his associates, of which an illuminating analytic report has recently been published.<sup>1</sup>

The great significance of this study is that, in contrast with most studies in vocational diagnosis, prediction, and guidance, in which elaborate procedures are often staged, accompanied by plausible arguments for their validity (which can only be determined by events of the future), Thorndike's study reverses the procedure: the present status of the group is checked against the specific test results and scholastic records secured ten years previously.

The experiment was essentially as follows: In 1920 to 1922, about 2000 boys and girls, approximately age fourteen, were carefully tested by the then best available tests of general intelligence, clerical aptitude, and mechanical aptitude. They were tested for reading proficiency with such tests as the Thorndike-McCall Reading Test. Such other facts as overageness and underageness were noted. For ten years this group has been carefully followed for the purpose of answering such questions as these: In what occupations are these individuals, who are now about twenty-two years of age, found? In how far would predictions of vocational success have been possible on the basis of the tests given to them ten years earlier? What is the relation of their present earning power to the ratings given them ten years earlier by the tests and other school records? Such questions are the essence of vocational diagnosis and guidance.

<sup>1</sup> Edward L. Thorndike. *Prediction of Vocational Success* (New York: Commonwealth Fund, 1934).

## 2. The Results

We quote several pertinent paragraphs of Thorndike's reports on this investigation.

There was an extraordinary variation in the careers of these children. One person was earning over \$5000 a year at age twenty-one; others had never earned anything. Abilities were varied and subsequent vocational success was greatly differentiated. Some left school immediately, others are still attending. The educational careers could be prophesied with great accuracy from the facts we knew at age fourteen. If we have a person's score at age fourteen, his subsequent educational career can be prophesied.

When, however, we pass from educational histories to vocational histories, there is a marked change in the predictive value of these items. Success at clerical work can be predicted better than success at mechanical work or at a mixture of mechanical and clerical work. The success of a worker in an office or a sales clerk can be predicted better than the success of an auto-repairman or a plumber. Yet even in the favored instances of clerical workers, the magnitude of predictability of the best composite of traits for vocational success is but .31. Such a prediction is little better than a chance guess. These low correlations show that there is but little relation between salaries earned and educational measurements. Employers do not get what they pay for, nor do employees earn in relation to their ability. There is very little free rational competition among employers for services or amongst employees looking for jobs. Salary levels are easy conventions. Both employees and employers are too easy-going and take what they get.

Job satisfaction, however, cannot be predicted with any greater certitude than salaries. Satisfaction with one's work can be acquired. Just as people can learn to adjust to handling snakes or drinking cod-liver oil, so can employees adjust to jobs. With time they can even like jobs for which they are unsuited or for which they had abhorrence.<sup>1</sup>

In the case of those persons who worked nine-tenths of the time from age eighteen to twenty-two at mechanical or manual work, the items of school record and test scores show correlations from .0 to .14. All are then nearly valueless alone or in combination as means of forecasting success at mechanical work. Much the same is found in the case of the 305 individuals who worked at jobs requiring a

<sup>1</sup> "Prediction of vocational success." *Occupations, the Vocational Guidance Magazine*, December, 1933.

mixture of clerical and mechanical work or who shifted from one sort of job to the other. Mechanical adroitness and general intelligence are the best indicators, but no combination of the facts at age fourteen would enable a vocational counsellor to foretell much better than he could by a sheer guess how much a girl or boy will earn at mechanical work six or eight years later or how happy he will be at it. High marks for conduct in school and regularity of attendance have zero value as they did (as predictors) for success at clerical work.

In the case of clerical workers, there is evidence that the predictive value of the tests and school record may become greater at later ages than at age 22.0. It is appreciably greater at age 20.0 to 22.0 than at age 18.0 to 20.0. In the case of mechanical workers and others, there is no evidence of this.

If there were perfectly free and rational competition among workers and among employers, so that the former obtained jobs exactly in proportion to the value of their services and the latter obtained quality in employees exactly in proportion to the wages they offered, the correlations of test scores and school record with wages, level, and interest might conceivably be double what we find. Even if this happened, school conduct and school attendance would still be of no value; and none of the facts would have more than slight significance for success at mechanical work.

The higher a pupil's scores are in tests of clerical intelligence, clerical activities, general intelligence, school progress, and scholarship, the more his success at clerical work will surpass his success at mechanical work. Conversely, the lower his scores are in these items, the more advisable it is for him to choose mechanical work. But the differences are not great. A bright and scholarly boy or girl who, because of interest or some special opportunity, wishes to learn a trade or work in a factory, may do so at no great disadvantage to himself. The same is true of dull children unsuccessful in school, who for any good reason are specially desirous of undertaking office work.<sup>1</sup>

Here, then, we have definite evidence of the extreme difficulty of vocational forecasting when appraised from the broad standpoint of attempting to predict future success over a period of years. This study indicates that it is almost futile to attempt to forecast vocational success as measured by earning power and liking for the job at age twenty-two on the basis of educational records and tests taken ten years earlier. This is not altogether a surprising finding and is far from

<sup>1</sup> Edward L. Thorndike. *Op. cit.*

equivalent to saying that all forms of vocational diagnosis are worthless. It must be remembered that the task set by Thorndike and his associates — to forecast relative earning power ten years later — represents probably the most difficult of guidance problems, albeit the most interesting and possibly the one of most practical direct worth to the man in the street.

Apparently, the forecast is vitiated chiefly by the large number of uncontrolled variables in the world of employment. Employers do not pay employees in terms of their abilities, as defined in school ten years earlier. To be sure, there is also apparently almost no relation between the kind of mechanical or clerical ability measured at age fourteen and the kind of mechanical or clerical ability for which employers pay wages ten years later.

## II. EDUCATIONAL GUIDANCE IN VOCATIONAL SCHOOLS: EXPERIENCES AT BALTIMORE

When we consider *educational forecasting*, however, the results appear in sharp contrast. Thorndike's study indicates that a pupil's educational status at age twenty-two can be forecast with notable accuracy from his test and school records at age fourteen. It is possible to predict at age fourteen with considerable assurance whether in the high school and college a student will achieve the greatest success in academic, clerical, or mechanical lines. (This is in reality the basis for an indirect type of vocational guidance.) As an example of this type of vocational diagnosis, certain facts from investigations made under the general direction of the Bureau of Measurement, Statistics, and Research of the Baltimore Public Schools may be of interest.

*The Membership.* Baltimore maintains vocational schools for both boys and girls, enrolling annually nearly 2000 students from age fourteen to twenty-one. These students come for the most part from the junior high school, although about 2 to 10 percent come from senior high schools and about an equal number from retarded 6A grade. A few come from parochial schools, the United States Rehabilitation Department, from local educational clinics, and similar sources.

*Reasons for Entrance.* A majority of these students enter vocational school because they want to learn a trade. This desire is based on their experience in academic schools. Many of them feel that trade training offers greater opportunities than academic training.

Many have unpromising academic records and turn to trade training for that reason. Some are disciplinary problems from the regular schools, a few are cases of truancy, still another small group consists of youths under 16 years of age who are looking for a place to stay until they reach the required age for release from school.

*The Diagnosis and Guidance Problem.* In this situation, the vocational schools find themselves semi-annually with entering classes of heterogeneous students of unknown vocational promise, gathered from all parts of the city. Some are old, some young, some bright, and some dull. Some have come as a first choice; others have only 'Hobson's choice.' Most of them have had the benefit of a counsellor's advice.

On entering, the vocational school requires that the student choose a definite trade. For years the choice has been based chiefly on the student's own judgment, a haphazard and treacherous procedure resulting too often in a pupil's discovery that the trade he has chosen is unsuited to his abilities. Many students were floundering in their courses, failing to make good, without knowing why. For the school year 1928-29, with a total enrollment of 467 students, the school had checked off its rolls an additional 433 students during that school year. This appalling turnover, caused by an abnormally high percentage of failures and withdrawals, indicated a grave need for some systematic guidance, not only in this school, but also in the schools from which these boys were received.

In view of this situation, an investigation was launched in 1929 by the Bureau of Measurement, Statistics, and Research and the Division of Vocational Education looking toward the development of better procedures. This work has since been carried on continuously under the direct charge of Mr. Albert G. Packard, specializing in vocational testing and vocational education and working in coöperation with the Bureau. A program of vocational and academic testing carried on for two years previously at Public School No. 76, an industrial demonstration school, indicated that it would be possible and practicable greatly to improve vocational school classification by means of suitable testing programs in vocational schools.

Tests were used for academic intelligence, for clerical aptitude, and for mechanical aptitude.

The results thereby obtained seemed to have definite usefulness in revealing students' vocational-aptitude trends. Even individual tests of mechanical, clerical, or academic aptitudes frequently revealed students of unusual, but hitherto undiscovered, ability. A striking case was that of a fourteen-year-old boy in the 8th grade who was about to drop out of school to work in a barber shop. Tests revealed an I.Q. of 155, a mechanical-aptitude score in the Stenquist

Mechanical Aptitude Test and in the MacQuarrie Test for Mechanical Ability placing him at the 99th percentile rank. As a result of these findings, provision was made for him to enter the high school. He has since graduated from the stiffest technical high-school course in the city and has earned a scholarship to the Johns Hopkins University. Many similar cases were found.

*Improved Criterion Score.* On the promise of these beginnings a definite testing program was next set up for all students entering vocational school, in the hope of developing test batteries which would forecast success in vocational school, our criterion now being the actual achievement in trade-school work.

To determine this achievement objectively and to reduce individual judgment to a minimum, each instructor in the trade work is required to record pupil achievement on a progress chart. This chart carries a complete list of all jobs or operations in the trade course. The student's record is kept by the instructor by checking off on this chart the jobs or operations as they are satisfactorily completed. Each year all instructors are required to rate their students on the basis of work completed, considering quantity, quality, and time. They are instructed, in a general meeting, how to use their progress chart as a basis for rating. The rating sheet is in the form of a graphic rating scale. Descriptive adjectives are placed beneath the line on which the instructor is to check. All ratings are transmuted into a sigma scale. This method of rating has now been in operation for five years and has materially reduced variation in teachers' marks.

*Findings.* Results have also been gradually improved by employing better mathematical techniques through methods of multiple and partial correlation. In our first efforts we drew profiles and made classifications based on sigma deviations of the test results. These classifications, which were later broken up into a five-point scale, correlated with the teachers' final ratings at the end of the course by a coefficient of  $.88 \pm .007$  ( $N = 478$ ).

*Forecasting Formula.* Our final step has been to adopt the multiple and partial correlation techniques and weighting methods described by Hull,<sup>1</sup> utilizing as a criterion the final rating for each student based on the quality and quantity of work achieved by the student in his courses.

This technique involves the use of a forecasting formula which is either a multiple-regression equation or based on one. The power of such prediction formulae is quite amazing to those unacquainted with their use. Consider, for example, the forecasting of the final criterion score for achievement in trade work. By means of a simple scientific

<sup>1</sup> Clark L. Hull. *Aptitude Testing* (Yonkers: World Book Company, 1928).

procedure, weights are assigned to each of the four tests in the battery, as follows:

General Intelligence	.048 = $W_1$
Stenquist Mechanical Aptitude	.22 = $W_2$
MacQuarrie Mechanical Ability	.02 = $W_3$
Stenquist Assembling	.344 = $W_4$

The forecasting formula for this particular battery is

$\bar{X}_0 = W_1 X_1 + W_2 X_2 + W_3 X_3 + W_4 X_4 + M_0 - W_1 M_1 - W_2 M_2 - W_3 M_3 - W_4 M_4$ , in which  $\bar{X}_0$  = Predicted criterion score;  $X_1$  = Test score in Test No. 1;  $X_2$  in Test 2, etc.;  $W_1$  = Weight for Test No. 1;  $W_2$  for Test 2, etc.;  $M_0$  = Mean of criterion;  $M_1$  = Mean of Test No. 1;  $M_2$  of Test 2, etc.

The use of the formula may be illustrated by this concrete example (an actual case):

John Angulus was given a battery of tests on entry to vocational school. It was desired to forecast from these results, with as great accuracy as possible, his probable success in the trade work. His test scores were substituted in the above formula and the result was our prediction of the most probable final rating that could be estimated from this particular battery of test scores. Without going into the computation, our predicted criterion score was 60; that is, the forecast suggested that John Angulus would do about average work in the trade school, where 63.5 was the mean of the criterion scores. *John's actual trade rating at the completion of the course was 62.*

It has been found that such predictions can be made with accuracy to the extent of  $R = .68 +$ , or with a percent of forecasting efficiency of about 30 percent better than chance. This is less than might be desired, but it is far better than plain guess work. Consideration of these results, in addition to the earlier coefficient of .88 quoted above, for a larger group, has greatly encouraged us to proceed in this field.

*More Refined Procedures.* A new criterion score, or final rating, is being developed by the construction of objective-type informational and performance tests. These tests are being given at the completion of each unit of work. The summation of the scores on all units for a specific trade is to be used as the criterion score. This will, we believe, improve our correlations.

Here, then, is an example of a type of vocational guidance with greater promise than that reported by Thorndike. More precisely this should be called *guidance in vocational education*. Even though it may not be possible directly to forecast future vocational success, it

seems quite possible to predict success in various trades within a vocational school. To the extent that students then actually follow the trade for which they are trained, this is predictive of vocational success.

On this point, a survey in 1929 of all the boys graduated from the Boys Vocational School up to and including June 1929 showed that 74 percent were working at the trade for which they were trained. The financial depression, as is to be expected, has materially affected figures since. A survey of 383 graduates for the years 1930, 1931, 1932, and 1933 shows that 192, or 50 percent, are at present working at the trade for which they were trained.

### III. DIAGNOSIS OF SPECIFIC APTITUDES

*Testing Aptitudes for Specific Immediate Jobs.* When we turn to the problem of diagnosis of vocational abilities for the purpose of indicating aptitude for an immediate given job, the possibilities of success are more promising than in the field of long-range, generalized vocational guidance of the kind described by Professor Thorndike. There is a wide literature descriptive of the work that has been done in devising testing procedures to select applicants for specific jobs. The work of Hull, Freyd, Bingham, Laird, Link, May, Paterson, Snow, and many others may be cited. The problem here is much more restricted than is the problem of forecasting future vocational success. There is ample evidence to show that it is possible to analyze most types of jobs and to devise methods of measuring the abilities required in the performance of them.

As pointed out by Hull, the recognition that a test, to be of real value, must forecast a *particular* aptitude or group of aptitudes, rather than measure some hypothetical or semi-metaphysical faculty, constitutes a great advance.

The list of non-academic aptitudes that have been attacked is already very extensive and is rapidly increasing. Hull gives the following partial list of workers who have been studied as indicating something of the scope of the investigations already begun:

General mechanic	Soldier	Insurance salesman
Auto mechanic	Prison guard	Department-store cashier
Engine-lathe operator	Fire fighter	Restaurant waitress
Motorman	Aviator	Factory employee
Auto driver	Retail salesman	Sewing-machine operator
Policeman	Traveling salesman	Telegrapher

Telephone operator	Business executive	Comptometer clerk
Compositor	Office boy	Hollerith operator
Grade teacher	Messenger boy	Free-hand draftsman
Registered nurse	General clerk	Musician
Interpretative reader		

The diagnosis of aptitudes has drawn emphasis again to the extent to which individuals differ from one another (which has been sufficiently emphasized by the testing movement in general); further, and more significant from the standpoint of guidance, the diagnosis has drawn emphasis to the differences among the traits possessed by the same individual. Apparently the distribution of traits within an individual follows the same general principles as the distribution among individuals. Hull estimates that "we shall probably not be in great error if we conclude that among individuals ordinarily regarded as normal in the average vocation, the most gifted will be between three and four times as capable as the poorest" and that the trait differences within a given individual will be about 80 percent as great as differences between individuals. This, of course, confirms the observations of life in general. For any individual it is altogether likely that his ability in his strongest trait may be from two to three times as great as his ability in his weakest trait. This state of affairs is, of course, of basic importance for vocational guidance. It has been amply demonstrated that it is possible to measure traits within an individual with sufficient accuracy to bring out clearly his strengths and weaknesses. Educational proficiency tests, trait tests, aptitude and prognosis tests are available in considerable numbers.

More important, however, is the fact that techniques are now known whereby it is possible to *devise testing procedures* that are effective, once the purpose of such testing is clearly defined, and provided the purpose is relatively specific. The work of Tyler at Ohio State University is particularly promising. The broad conception of techniques of testing presented in earlier chapters of this Yearbook is of far-reaching significance. As there pointed out, the all-important step is the clear definition of objectives. This is, of course, as true in the diagnosis and measurement of vocational traits as in academic traits.

The problems incident to a successful program of vocational education are probably as intricate as those of general education. Large numbers of students needlessly fail in vocational as well as in academic courses. But educational technicians can in large measure remedy

this. Intelligent diagnostic procedures are just as feasible in vocational courses as elsewhere. Trial courses and effective testing programs are among the useful means of preventing failure. Here, as elsewhere, capable leadership is the *sine qua non*.

But, vocational education is in its very nature most closely bound up with vocational guidance. *And, guidance in its broadest sense transcends all other problems of education*; trebly so now, because of the economic upheavals throughout the world, resulting in unprecedented unemployment and postponement of entrance into jobs. Guidance, both direct and indirect, is unquestionably the most challenging item in modern education. With thousands of students, both vocational and academic, being annually graduated to join the millions already unemployed, with the lengthening of the pre-employment years available for training, with unemployment challenging the combined forces of our civilization, with a political-financial structure that has brought us to the verge of catastrophe entailing hunger and suffering as in times of war or famine despite the fact that we are living in an age of unprecedented surplus more than ample to fill the needs of every citizen — with these conditions confronting us, guidance is needed as never before, but guidance based on a broader foundation than we have thus far conceived it. Diagnosis in vocational education inevitably involves vocational guidance. But the issues that true guidance now implies are not confined to the schoolroom; they involve also far-reaching political and financial changes in our whole social structure.



# CHAPTER XXI

## THE DISCOVERY AND GUIDANCE OF MUSICAL TALENT

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### I. THE PROBLEM

Guidance in music assumes three aspects: the educational, the avocational, and the vocational.

Music is the most universal art, but the outlet for a professional career is relatively limited to four fields; namely, that of the composer, the conductor, the virtuoso, and the teacher.

The highest form of musicianship is that of the composer, who represents superior creative power that is very rare. The conductor is the supreme interpreter and represents the greatest versatility, together with the power of leadership. The virtuoso is the winner in a severe struggle for survival. He represents a very small percentage of those whose ambitions lie in that direction and is often regarded as a technician with a limited outlook on the larger aspects of music. The teacher is the pedagogue and may or may not possess musical talent.

The talent required for each of these four groups is radically different, the necessary education is different; the resultant personality is radically different. Differentiated guidance toward these fields is, therefore, of the greatest importance, as it involves not only questions of expensive preparation, but, what is more important, the making or breaking of human hearts in success or failure. Yet, from the point of view of public education, it is relatively unimportant because all these vocations together comprise less than one percent of the normal population that craves musical guidance.

The problem of guidance in public schools, therefore, becomes primarily one of guidance toward the appreciation of music and self-expression in music for the joy of expression in itself; that is, a problem of educational and avocational guidance, whether it be for the various degrees of amateur performance or for the general appreciation of music.

The outlets and media for expression in this large area of the mu-

sical life embrace all conceivable forms of music from the most primitive beat of drums through the countless varieties of instruments, the various gifts of voice, the power of dramatization, and the various functions and rôles in the service of music in the health and the life of the home, community, church, and art.

It is, therefore, clear that musical talent is not one thing; musical education is not one thing; and the effective functioning of music in the life of the people is not one thing. Hence the problem of guidance becomes extraordinarily complicated and is full of undreamed of possibilities.

This chapter will be restricted to a consideration of the discovery, the evaluation, and the guidance of musical talent and will not touch upon the problem of means of education or outlets for the trained.

## II. THE NATURE OF MUSICAL TALENT

In the popular mind, a person is either musical or non-musical, just as he is supposed to be either sane or insane. The fact is that we are all more or less sane and all more or less talented; it becomes a question of degree, kind, and value.

Musical talent is not one thing, but a hierarchy of talents as varied, as interrelated, and as dependent upon soil, environment, and inherited traits as is the vegetation of the forests. There are oaks and poplars, annuals and perennials, flowers and thorns, luscious fruits and pernicious weeds; so in the musical organism and its function there is vast diversity. Yet in the kingdom of art, as in the plant kingdom, there is law and order in the relationships. As in the plant kingdom, the seed is always there. But what kind of seed is it? What chance does it have of coming to foliage and fruitage through the operation of natural laws and planful cultivation?

This concept of the variety, intricacy, and vastness of talent, however, does not discourage the scientific approach to its analysis; because musical talent has its taproots, its modes of branching, rebranching, and enfoliage, and there is a possibility of establishing classifications and making quantitative measurements which may have a wide sweep of application. This faith in possibilities springs from the psychological laboratory where the scientist is satisfied to fractionate the problem and deal intensively with one issue at a time.

The scientific approach is, however, represented by a very small minority of those who are engaged in guidance or will be so in the future. This could not be otherwise in view of the scientific pre-

requisites in training for that point of view. It is no discredit to the ordinary teacher or musician that he or she does not have it.

Fortunately the situation is relieved by nature's provision for survival. In the vast majority of cases the question of prognosis is not raised, but the child is thrown into the musical situation and, if he has it in him, he may come out happily; but at the best this process involves enormous waste in the field of musical nature. At the present time, by far the best and most universal test that we have of musical talent is achievement. Small children are thrown into the musical situation and, if the character of achievement is watched intelligently, there is not much fault to find with that procedure; it is safe, although wasteful.

### III. THE APPROACH

The fundamental challenge that the psychologist has to give to the music teacher and supervisor is this: keep each student busy at his natural level of successful achievement. The emphasis should be laid on the words "each," "natural," and "achievement." To do this, the average teacher should be conversant with three fundamental findings of the psychology of individual differences in musical talent.

#### 1. Three Fundamental Findings

1 First is *the enormous difference in talent* of apparently similar individuals. It is a general rule that the more precisely we measure specific capacities in a group of individuals, the larger the difference that will be found. Thus, it is easy to find in a group of normal children one who has 200 times the capacity for hearing of pitch that another equally bright child might have. Similar, but not quite so large, differences are found for tonal imagery, the sense of time, sense of rhythm, sense of loudness, musical imagination, musical thinking, and the capacity for motor skills. In ordinary observation of achievement or performance these differences are covered up, because the factor under consideration is not isolated for exact valuation.

2. Next to the revelation of the surprisingly large extent of individual differences is the revelation in psychology of *the relative fixity of some of the innate capacities*. We must say "relative" for two reasons: (1) the physiological capacity is often not reached in measurement; and (2) physiological capacity is itself a relative term from the point of view of genetic psychology. Yet the more we employ the rigid controls of the scientific methods of analysis, the more clearly

we identify specific capacities and the better we are prepared to take the limits of possibility and variability into account.

This theory of the relative fixity of a few basic capacities is a moot question and is at the bottom of the most fundamental theories and philosophies of musical education. Genetic psychology does not furnish ground for any fatalistic treatment of the individual in this respect, but gives us a most revealing insight into the nature and the possibilities of our problem.

3. The third finding in our experimental psychology of music lies in *the revelation of ways and means for the adjustment of talent*. Tonal memory, for example, is a talent present in vastly different degrees; but there are many kinds of tonal memory. An impediment that would be prohibitive in one situation would present no difficulty in another. The educational curriculum, the types of social activity in music, the ways of planning personal satisfaction in performance, and the methods of training are all contingent upon knowledge of the nature and extent of specific talents.

## 2. The Use of Technical Methods

With this preamble, we may proceed to a presentation and evaluation of some of the more technical methods of diagnosing and directing musical talent. Interest in that approach is of comparatively recent origin and yet we already have what may be called 'schools of thought' on the subject. I shall not attempt to describe or evaluate each of these, but shall take the liberty of presenting a constructive point of view as maintained by myself and associates from the Iowa Laboratory.

The basic principle in our approach is that musical talents can be measured in a fair sampling and that in such measures rigid laboratory techniques can and should be used. This does not mean that every measurement shall be made in a laboratory, but that when a test or measurement is taken out of the laboratory, it shall be in such condition and under such control that it satisfies laboratory conditions.

The laboratory point of view hinges upon two fundamental principles in experimental science.

The first principle is that we must isolate one basic factor for variation and measurement at a time and keep all other factors constant. For example, instead of asking the question, "Can this child hear music?"; we ask, "Can he hear pitch?"; "Can he hear loudness?"; "Can he hear time?"; "Can he hear timbre?"; "Can he hear

rhythm?"; "Can he hear tone quality?" Each of these can be isolated for measurement; and, when we have the result, it is recordable, repeatable, verifiable, and predictive. What is true of hearing has its parallel on the side of performance as represented by skills. We do not ask, "Can he play?"; but we ask, "Can he play a tune in time and in rhythm?"; "Can he phrase?"; "Can he produce good tone quality?" etc. Such questions have their parallels at the higher levels of imagination, memory, thought and feeling; although the higher, and therefore the more complicated, the process becomes, the more it tends to resist analysis.

The second principle is that we must limit the conclusion to what is involved in the one factor that was varied under control. Thus, if we measure the sense of pitch and we find that the record made is in the 99 percentile, the conclusion is not that the child is musical, but that he has an extraordinary sense of pitch—that he is superior in one of the scores of talents essential to musical success. He may be utterly incompetent in other talents.

Amateur guides in music are gross sinners through violation of this principle. Indeed, adherence to the principle at any cost is the supreme safeguard of scientific guidance. The bold and positive guidance in an unanalyzed situation is, of course, condemned on this principle, if such guidance makes any pretense of being scientific. This technique should, of course, not be taken to discourage the discriminating use of any information that the teacher or guide may have, providing it is judicious.

### 3. Criticisms of the Approach

The application of these two principles meets criticism from several points of view.

Many theoretical psychologists will say it is atomistic and point out that genuine talent is not the sum of specific talents. The psychologist in music accepts and is really the sponsor of the idea that the total talent is not the sum of specific talents. He maintains that talent is, indeed, an integrated whole, but that we get truer and deeper insight into this integrated whole by employing the scientific method of fractionating; that is, by observing one aspect at a time.

Others point out that it is futile to make specific measurements, because according to our theory there are scores and scores of specific capacities that are integrated in the hierarchy of musical talent as a whole and only a small number of these can be measured in a given

case. The answer to that criticism is that it would be unscientific to maintain that anyone would ever have the time or ability to measure everything, even in such basic principles as laws of gravitation, permeability, or heat. The value of selected measures hinges upon whether or not they are of a basic character; for example, there are countless aspects of rhythm in music, many of which could be isolated and measured as such, but one basic capacity for all rhythmic performance is a genuine 'sense of rhythm.' Likewise, there are hundreds of varieties of hearing of pitch, but the measure of the 'sense of pitch' is basic for all.

Another criticism comes from the clinical psychologist who maintains that real insight and true interpretation are gained only by a study of the total personality in the total situation. There is truth in that contention, but the criticism is met by the fact that it is possible to measure a specific capacity during performance in unhampered musical mood, and in every respect in the actual musical situation. In measuring capacity for performance in singing at the present time, the singer performs in an acoustically treated music room in which there are no instruments present other than a microphone (of which he may be quite oblivious); but from that microphone there are made simultaneously phonograph records and records from three or four cameras operating simultaneously in such a way that from these records every detail of the performance as a whole, or at any moment in the performance, may be reconstructed with high order of precision. There the singer performs in the musical mood and in the musical situation, but the instruments analyze and set forth the elements involved.

Other critics say that if we limit ourselves in this way, we will know so infinitesimally little about the total musical mind that it may be of doubtful value. The answer to that is that such humiliation is true but wholesome. Awareness of the fact that you have only a small sample of measures makes you correspondingly cautious and restricted in your application. The musical guide must be profoundly conscious of how little he knows of the possible mass of talent. The practical teacher wants a wholesale judgment; the psychologist refuses to give that and simply says that such and such facts are known and may have such and such bearing on the problem.

Another criticism is that measures of talent do not enable us to predict, because development of talent is merely a matter of training. This a psychologist would simply deny.

#### IV. THE VALIDATION OF SPECIFIC MEASURES OF MUSICAL TALENT

In spite of these limitations, experiments have been conducted to determine whether or not a small battery of measurements of talent can be of predictive value in themselves. There is no question but that these measures are of value when taken together with auditions and measures of achievement; but in order to determine the value of the measures themselves, it was necessary to strip them of all the associated aids and validate them, as it were, in their own name.

This project has been carried out on a splendid scale with great expense for a period of more than ten years, mainly under the direction of Professor Hazel Stanton, in the Eastman School of Music. She has published a number of reports unfolding the project progressively and with fine scientific acumen. Dr. Hanson, director of the school, has assured the continuity of the experiment under favorable conditions. Dr. Stanton's work in the administration of these measures in the Eastman School is continued by Dr. William Larson. Dr. Stanton writes from the Psychological Corporation in New York City.

Every pupil entering the school was given six tests, known as the "Seashore Measures of Musical Talent"—on the sense of pitch, the sense of time, the sense of intensity, the sense of rhythm, the sense of consonance, and musical memory—at the opening of the school year, as a part of the placement program. On the basis of these measures, a classification was gradually developed. The quantitative records were classified on the letter scale a, b, c+, c-, d and e, so as to give an approximate and normal distribution in the curves. These six measures were paralleled by a measure of comprehension or intelligence, with the letter scale in the same manner. The two series were regarded as representing quite independent factors; that is, with given sensory capacities, the promise of achievement depends on the degree of intelligence associated therewith.

On this basis, the classification as shown in Table I was gradually developed and validated. Here it is seen, for example, that if the student rates 'c' on talent measurements and 'c,' 'd' or 'e' on intelligence, he is rated as 'discouraged'; whereas if he has a 'c+' rating on talent, combined with 'a,' 'b' or 'c+' on intelligence, he is rated 'possible.' Classification on the basis of achievement was made parallel to this and was based on teacher ratings on achievement in instrument or voice, on an analyzed scale in the student's first-semester class records. The psychological measurements were kept in the hands of the psychologist and the director of the school, so that all

records of achievement were made without knowledge of the talent measures. Prior to the most recent report, 978 students in seven classes had been rated in this manner.

TABLE I.—THE CUMULATIVE KEY. TEST COMBINATIONS OF MUSICAL TALENT AND COMPREHENSION GROUPED INTO A FIVE-FOLD CLASSIFICATION

<i>Discouraged</i>	<i>Doubtful</i>	<i>Possible</i>	<i>Probable</i>	<i>Safe</i>
C+, E	B , E	A , E	A, C—	A, A
C—, C+	C+, C—	B , C—	A, D	A, B
C—, C—	C+, D	B , D	B, B	A, C+
C—, D	C—, A	C+, A	B, C+	B, A
C—, E	C—, B	C+, B		
		C+, C+		

This battery is far from complete. Only six talent measures and only one brief intelligence measure were used. If to these had been added the corresponding motor tests and some affective responses, the predictive value would, of course, have been greatly increased. Furthermore, the form of the six talent measures used was that of the original phonograph measures, which are now being thoroughly revised in a new edition that is certain to give much higher reliability and should, therefore, afford better predictive value.

I have never advised the use of such measures alone, but have constantly urged that they be used as aids, especially in connection with auditions and analyzed records of achievement. Professor Stanton is to be congratulated on her patience and rigorous control of the situation in thus validating the battery of measures by itself.

Space in this article does not permit a discussion of the results of this experiment, but a complete report is in press.<sup>1</sup> To show to what extent the above classification was successful in predicting graduation from the music school, it may suffice to say that of the 565 students graduating within four years, the percentages graduating from the groups classified as Discouraged, Doubtful, Possible, Probable, and Safe were 17, 23, 33, 42, and 60, respectively. When this battery by

<sup>1</sup> Hazel M. Stanton. "The Measurement of Musical Talent." *Univ. of Iowa Stud. in Psychol. of Music*, Vol. II, Iowa City, Iowa.

itself, apart from auditions and other tests, can predict to the extent here indicated, we can see that the Measures have a clearly established value for the purpose.

#### V. GUIDANCE IN THE PUBLIC-SCHOOL PROGRAM

In viewing the results of this experiment of the Eastman School of Music, Mr. Eastman said: "You have rendered our school a great and permanent service. You have saved large sums of money and have rendered a humanitarian service to these pupils. But that is all negative; is it not possible to do something positive?" My answer was: "Yes. Introduce a dragnet service into the public school system, whereby the exceptionally talented may be discovered early and encouraged musically."

As a result of that suggestion the public schools of Rochester, New York, are employing a psychologist for this specific job. Dr. Ruth Larson, who is now in the fourth year of this experimental service, has outlined the operations briefly as follows:<sup>1</sup>

1. *The placement of instruments.* The instrumental department has a large number of musical instruments as a result of very generous gifts by philanthropists of the city. Also, practically all the schools of the city own instruments. These instruments are placed with the more musical children through the aid of the psychological tests.

2. *Recommendations concerning the purchase of instruments by parents* More and more, parents are requesting psychological tests before purchasing instruments for their children. Upon request, after the test appointments, conferences are held with the parents, and in the light of information that has been acquired concerning the child and his talent, suggestions are made as to the kind of instrument for which the child seems best equipped.

3. *Segregation of instrumental classes.* Contrary to ideas that many have had on the subject, it has been demonstrated that there is more incentive for the majority of students to work at their highest level when they are in a homogeneous group. It is a mistake to place the less talented student in classes with the more musical students. Instead of the highly gifted students acting as an inspiration to the less talented ones, it tends to discourage them. Nor is it beneficial for the talented children; the competition is not so keen, and they are not taxed to their best efforts. Therefore, children of like musical capacities are placed in the same classes whenever the schedules will permit.

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<sup>1</sup> In an unpublished paper.

4. *Coöperation with the music teachers in the study of unusual cases.* Close attention is given to students who are reported as having early indications of unusual musical aptitude. These children are studied and then given the benefit of special opportunities for musical development whenever possible.

5. *Check on accomplishment* A report of grades for all students receiving instrumental instruction is filed at the psychology of music office. These reports are studied, and in case the report varies decidedly from what might be expected from the student's talent chart, an investigation is made in an attempt to discover reasons for this discrepancy. If the trouble is due to a lack of application, irregular attendance, or some other personal indolence, the student is informed that in order to take advantage of free musical instruction provided by the board of education, he is expected to progress at a rate in conformance with his capabilities. This pertains equally to those who own their instruments and to those who are using school instruments. This general check on the relation of talent to progress cultivates a higher level of efficiency in the classes.

When there are interferences that hinder the student in making good progress, and it is necessary to recall the instrument, it is placed in the hands of one of the numerous applicants of high talent on the waiting list, preference being given to those with the highest talent ratings. In this group of high talents may be found many who do not have the means to purchase an instrument but must await an opportunity for the use of a school instrument or help from some other source.

6. *Coöperation with various organizations interested in child guidance.* Students are often referred to the music psychologist by such organizations as the Children's Service Bureau, Visiting Teachers Department, Special Education Department, and various members of the Child Study Department for a consideration of their musical aptitudes, with a view to the significance the development of musical talent might have in the readjustment of these special cases.

7. *Limitation of instrumental classes through talent testing.* It is recognized that the teaching of music is expensive. A psychology of music program attempts to help conserve resources for their most profitable use. Although it is the general policy to adopt a positive attitude with an endeavor to help and guide the child in music, it is necessary to protect the school and the teacher by refusing to recommend the lowest type of talent for instrumental instruction.

Although the present program concentrates on work with the instrumental department, numerous opportunities come for service in other branches of school music. . . . Thus, an influence has inciden-

tally carried over into another department of school music. The vocal teachers also send students to the central test room, sometimes for the consideration of recommending further study beyond high school as a vocation, or for an understanding of why a student with a voice of excellent quality is not capable of singing in time or tune in the vocal ensemble classes. These are but examples of services in other branches of school music. The growth in the demands for the psychology of music service is taxing the present facilities, and the enlargement of the program to include other branches of school music, where it can be just as serviceable, is in process.

Since greater emphasis is being placed on the importance of musical development at an early age in school, greater opportunity is offered for guidance through psychology of music at this critical time. . . . The testing of musical talent at this level has the advantage of obviating an expensive and inefficient trial-and-error sifting for those inherently equipped for achievements in music.

I have not attempted here any comparative evaluation of the current test material. There are now, and there are certain to be in the future, new developments in this field. The literature is very extensive. During the last few years much work has been done in the comparison of the Kwalwasser-Dykema tests with the Seashore measures. Both are on phonograph records and in the main cover the same general field.<sup>1</sup>

## VI. RECOMMENDATIONS

### 1. The Training of Teachers

*The training of teachers in the art of the analysis and adjustment for talent* is the first great need in the realization of the goal for musical guidance on a large scale. That the burden falls first upon the teacher in the classroom becomes evident when we realize that the commonest evidence of talent is, and always will be, the character of performance in the early stages. To appreciate this, requires a rather highly organized technical training in the job analysis of the musical situation, the talent analysis of the child, and the actual organization of progress in training on the basis of these two sets of information.

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<sup>1</sup> Outstanding among the numerous reports of such experiments is perhaps that of Professor Paul R. Farnsworth, of Stanford University, in his latest monograph, "An Historical, Critical, and Experimental Study of the Seashore-Kwalwasser Test Battery." *Genetic Psychology Monographs*, May, 1931.

We are, however, not sanguine enough to regard it as reasonable to expect that of all music teachers. The demand, therefore, presses chiefly upon supervisors who themselves understand the situation and have the power to command the few who can coöperate in this service. The immediate responsibility for awakening interest in the possibilities of the art of music falls upon the training institutions for music supervisors. It is incumbent on them to share some of the time for methods of teaching with expert training in music guidance. Before this is done, no claim can be made for the application of science to the art of teaching music.

## 2. An Organized Guidance Program

A guidance program calls for systematic observation in auditions, measures of achievement, and measures of talent. In the ordinary musical situation natural selection operates at an enormous sacrifice, more or less through chance survival.

*a. Auditions.* To obviate this waste and to discover and direct talent, the scientifically trained teacher or supervisor will organize a systematic procedure that may informally be called 'auditions.' It will be in the hands of a competent person who can move unobtrusively in the actual musical situation and observe and record specific evidences of the presence or absence of talent, in a cumulative record that will facilitate guidance. This 'auditor' will, of course, get most leads from the teacher and thus furnish every teacher an outlet for influence in this service.

We teach too much; we drill too insistently; we inspire too little. A distinctive place in the training program should be assigned to auditions. When this is done by a qualified person, much of the routine teaching and drill work can give place to spontaneous self-expression and self-direction, and the problem of motivation will be solved. If asked how to reduce the budget in the music department, that is the method I would pursue. Early discovery, systematic record, and the assurance that merit will be rewarded will furnish the greatest drive that can possibly enter into the musical life of the school. A social and competitive program in which the student is encouraged to live in an atmosphere of self-expression and service in music is extremely valuable in the revelation of talent.

This 'audition service' should, of course, be responsible for the organization and conduct of all measures of achievement, and it is now a well-established fact that the timely and effective measure-

ment of achievement is an effective tool in the organization of instruction. Achievement tests may often take the form of actual competitive performance. More emphasis should be placed on evidence of self-direction, self-motivation, and self-criticism than upon mere passing grades on routine instruction. The early documenting of specific abilities exhibited in performance is very valuable.

*b. Surveys.* As measures of musical talent are progressively standardized, validated, and made available in inexpensive, safe and reliable form, surveys may be conducted in various ways. These surveys should serve two primary purposes: (1) the discovery of outstanding and perhaps unrecognized talent of various kinds; and (2) the identification of persons seriously lacking in talent. They should never be undertaken except where there is a deliberate and effective intention to 'follow up.' Tests of this kind should be of such character that their use will be fully justified by the teaching-value alone in making the music population conscious of the existence and significance of specific aspects of music.

The most profitable all-city survey would be in the fifth grade and the second survey if undertaken should perhaps be in the eighth for obvious reasons. A more specific and immediately profitable use of surveys is in the progressive organization of music units, such as orchestras, bands, choruses, highly specialized organizations, and individual instruction. Here the analysis of measures of musical talent should be a fixture in the procedure, and every student should know exactly how he rates in this and that.

*c. Remedial Work.* Remedial work should play an important part in the organization program in the ordinary course of instruction and musical activity. The pupil faces an unanalyzed situation and may show marked defects of which he is not aware. Our demand for analysis and measurement of specific elements in performance favors the development of a system of remedial work that may be undertaken to great advantage. Many a singer who flats has simply fallen into a bad habit and can be whipped out in a few minutes of intensive attack, if there is an adequate sense of pitch. The same is true in each of the basic capacities, such as volume-control, time, rhythm, and tone-quality. There are now instruments available by which a person can test, check, and correct his faulty performance in a very short time, and to a very high degree. Such procedures make the pupil conscious of the defects he has. Most of the faults and defects may be attributed to sluggishness on the part of both pupil and teacher.

in the discovery of error. The scientific method will act as a whip. The need of this is, of course, most notoriously exhibited in the matter of the control of tone-quality. Instead of thinking loosely in general terms of 'good' and 'bad,' the pupil should be made conscious of his specific weakness and the ways of remedying it.

In a sense, the guidance program should always be of a negative and protective character. At every turn, the pupil should be encouraged to follow his natural urge. The musical guide will then analyze the situation to determine whether the choice is wise and in accordance with natural talent. This advice favoring a protective attitude rather than a positive and directive attitude is essential to the scientific approach. The ordinary guide is far too ready to direct the future of the pupil on the basis of superficial evidence.

Appreciation of music is not primarily a problem of guidance. It is rather a problem of providing facilities, motivation, and, best of all, forms of participation that make the pupil feel that music is in him and of him, because appreciation is ultimately a form of expression.

### 3. Selection and Guidance in the Music Schools

If the purpose of a music school is to secure and encourage the musically gifted, the record of achievement should be preceded by the measurement of specific talents. The person in charge of admissions, assignments, and promotions should have measuring instruments and techniques at his command. A survey does not guarantee that the pupil who rates high is musical, but it furnishes a series of significant facts that the musical guide in charge of admissions and promotions will find most valuable.

The main significance of specific measures of talent lies in two respects: (1) that they can be applied before expensive training is undertaken; and (2) that they serve as a guide in the choice of a musical medium for training.

There are, of course, two features that militate against this procedure: one is the blind ignorance of the musical profession as to the existence and significance of talent, and the other is the necessity of maintaining patronage in defiance of principles. Teachers and institutions can no longer hide their faces under the veil that there is no way of knowing talent in advance of training.

#### 4. Professional Guidance for a Career in Music

There is no simple or formal procedure for the guidance of those who are genuinely talented for a career. The urge for a career normally breaks out early; if fortunate in the choice of a teacher, the best avenues for development are often discovered. No tests or measures or experiments are an essential, though they are often very valuable. The main factor is the professional training and equipment of the guide, his freedom from fads and prejudices, and, let us add, from financial interest in the outcome. He must be a musician or work in cooperation with musicians; he must be a scientist in his mastery of the analysis of capacities and insight into the nature and laws of development of the musical mind.

If an extensive and ambitious career is contemplated, an intensive analysis should be made in a laboratory to evaluate the probabilities of success in the chosen course of development and especially to discover and evaluate any serious shortcomings that may exist.

In conclusion, the recommendations for guidance should contain a number of 'Don'ts.' Don't let any guide say to any pupil, "Be this," or "Be that." Musical nature is prolific and the principal function of the guide is to reveal special abilities and to guard against serious handicaps. Don't look for any foolproof system of guidance; at the best the situation will be analogous to that of the physician who is consulted about the health of a patient. Don't assume that it is desirable to have a regimentation of vocational guidance planted upon all pupils. Don't rush a guidance program any faster than the development of competent guides will warrant.



## CHAPTER XXII

### DIAGNOSIS IN ART

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In its broader aspects art now is receiving an enhanced appreciation, held back chiefly by its unfortunate classification as a luxury and by the lack of scientific insight into its instructional aspects. Its benefits and functions have not been obvious to practical-minded elders who favored more tangible and direct aids to economic competence.

To anyone envisaging the functions of art down through the ages this attitude of neglect and limited discernment of the rôle of art is difficult to defend. The lessons of the war of 1914-18 have been almost unheeded. Use of poster art in the control of political attitudes has made headway in Great Britain; and in the United States and Europe, art has found wide utility as the handmaiden to commercial advertising and, sporadically, as a means for enhancement of value in commercial products, notably on small articles and the automobile. The connections of art with religious practice, visual education, social control, social determination of trends, and potent suggestion through the motion picture have not received attention commensurate with their social importance.

#### I. THE FUNCTIONS OF ART INSTRUCTION

The objective of art instruction has generally been stated as the development of appreciation and the enjoyment of leisure time. Such is obviously inadequate, as this quotation from Winslow<sup>1</sup> will indicate.

A knowledge of art is essential (1) to our social life, because most well-informed people are today discussing art matters; (2) to our industrial life, because quality in most manufactured products is determined largely by the element of art that enters into their design; (3) to our business life, because the art quality in advertising and in the arrangement of goods for display is an important factor

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<sup>1</sup> Western Arts Association, *Ann. Rpt.*, 1928, pp. 24-25.

in promoting sales, (4) to our spiritual life, because pictures, buildings, statues, and the common things of daily use take on a new significance when their artistic meaning is understood; (5) to our mental life, because the study of art is now considered one of the fundamentals of a liberal education; (6) to our understanding of current events, because newspapers and other periodicals contain numerous references to works of art; and (7) to the all-round development of children, because they are even now facing art problems in their daily lives as children and because they, in their time, will face critical esthetic issues of the utmost importance.

As organized today, instruction in art presents four aspects: *information* about art in man's cultural development (history of art); *representation*, or construction of likeness of objects by manipulation of line, mass, light and dark, or color (cast-drawing, still life, etc.); *expression*, in which the personal experiences of the individual tend to determine the character of the graphic organization; and *design*, which is related to expression in that it is a more or less individual arrangement of known elements.

### 1. Information

In its more complex aspects information merges into appreciation or perhaps contributes toward the ability to appreciate or recognize merit in works of art. Where appreciation is more or less personal and applied to common objects of everyday interest, it becomes *taste*. Appreciation based on both information and a sensitive psychophysical organization provides the basis for esthetic judgment, which generally is necessary for the highest forms of creative expression.

### 2. Representation

In practice it is hardly feasible to separate the functions of representation and expression. Each has its following among the teaching fraternity and disinclination to see value in one has caused the other to receive emphasis and in many instances perhaps undue attention. There seem to be some grounds psychologically for the assumption that free expression is the more natural outlet for children in the early years (preschool and perhaps Grades I to III) with training in fundamentals judiciously introduced at any point where it seems desirable. Prescription is hardly possible or desirable. At special art schools persons like Bridgman hold that training in technique is all important; many of the great artists show masterful techniques that reflect such

early training, but this situation is hardly applicable to the grade school.

The study of Moeller<sup>1</sup> on two groups, one taught by a conventional directed training plan and the other permitting free expression without instruction obtained some evidence for greater gain by the children in the directed group. The children were of ages between five and seven, and the gain was measured by five exercises, one in design, two in representation, and two in expression.

### 3. Expression

In its simplest terms *expression* refers to a graphic, personal interpretation of experience. The experiences may be direct, imaginative (compounded of consummated experiences), or memorial (using memory images in any state of preservation directly). *Illustration* usually is in major character expression, even though the subject matter be a familiar Mother Goose story. A trip to the bakery or to a farm or to the seaside constitutes experience that may find expression subsequently in as many ways as there are children and in forms quite different from those of adults. Playful manipulation, frequently tinged with humor, and distortion are commonly found; these may contribute to an effect describable as creative interpretations of subtle qualities inherent in the objects or characters.

The production of beauty (in broad sense—not as mere prettiness) is but one objective of art instruction. Art in its applied or utilitarian aspects<sup>2</sup> holds perhaps more interest for the average pupil. From the lists of objectives earlier mentioned, the following may be regarded psychologically as especially significant: (1) training in graphic expression, (2) improvement in habits of visual space perception, (3) training of sensory coördinations with particular muscle groups, (4) development of discriminative judgment, (5) enhancement of esthetic taste, and (6) enrichment of cultural background.

The older conception of art as *drawing* has largely given place to a broadened conception including in the better equipped and manned schools drawing and painting in several media, modeling, decorative design, murals, and crafts, including work in metal, leather, wood,

<sup>1</sup> Master's thesis, Art Education, Univ. of Iowa, 1931. In process of publication.

<sup>2</sup> These aspects are many and are well presented in available texts, typical ones being Whitford's *Introduction to Art Education*, Mathias's *The Teaching of Art*, and Klar, Winslow, and Kirby's *Art Education*.

textile, reed, and other materials. Correlation with subject matter in social science, history, Latin, and domestic science has proceeded apace, bringing into art fresh interest and vitality.

## II. THE RELATION OF ARTISTIC CAPACITY AND ABILITY TO PRODUCTION AND APPRECIATION

### 1. The Source of Talent

The mystery surrounding art talent is steadily giving way to scientific scrutiny. Belief in the 'gift' theory leads nowhere. Another view that almost anyone can be taught to draw does not include the assumption that anyone can be made into an artist. School records show great variations in achievement, but the answer offered by some to this fact is that motivation and teaching opportunity are seldom adequate to give the needed individual attention.

The Carnegie research program, carried on at Iowa<sup>1</sup> under the direction of the writer, provided opportunity to put this question to experimental test. A. W. Saunders selected twelve children between the ages of five and ten years, all of whom had shown little interest or competence in art. After a two-year period of intensive contact, during which various effective teaching devices and motivating schemes were introduced, measurement of products at beginning and end indicated that two of the twelve had risen to superior performance, five to an average status, while two had failed to show material change. (The other three could not complete the training.) This outcome suggests individual variation in the matter of susceptibility to training. Apparently considerable reclamation is possible from the ranks of those not making progress in art, through the use of procedures to be outlined later in this chapter.

The available evidence justifies the assumption that artistic aptitude is distributed in the general population in the form of the general distribution curve. At the upper end will be found those to whom the acquisition of art ability will be easy and the development or enhancement of appreciation rapid. At the other end will be those in whom such development will be difficult and retarded.

The hypothesis regarding the inherited aspect of art ability that seems to be most largely in harmony with the facts is one suggesting some form of orthogenesis. Direct inheritance of skills is very un-

<sup>1</sup> Genetic Studies in Artistic Capacity, sponsored by the Carnegie Foundation for Advancement of Teaching, 1931-.

likely; the fact of children following parents in artistic competency is explained just as well as an inheritance of general morphology or of a type or general stock that happens to be readily adaptable to pursuits that demand craftsman skills or fine eye-hand and similar coördinations. In stock that precedes and in the stock that follows may exist competence that found outlet in engraving, drafting, construction and repair of fine instruments, cabinet-making, and similar pursuits. If such activities are not found in any ancestor up to seven or more generations, an investigation of hobbies and incidental interests will often supply significant information. In no other way can the case of Loran Lockhart<sup>1</sup> be explained. This child, blind from birth, had a fair degree of vision provided at the age of seven by operations for complete double cataract and by special glasses. His paintings, approximately equivalent in quality to those of normal children of his age, can apparently be explained only through presence of craftsmen in ancestry. The esthetic environmental influence during the brief period elapsing since the final operation is practically nil, the investigation disclosed. The Rodgers study<sup>2</sup> made on the esthetic character of an approximation of the total environment affecting selected children, some artistically competent, others not, indicated that the environment of the former was only slightly better than that of the latter.

## 2. Capacity, Ability, Aptitude, Appreciation, and Talent

*Capacity* is taken to mean the more or less inborn developmental limit, potential reserve, or capability for performance that is realizable through training and use. *Ability* refers to the more immediate reaction possibilities, or realization of skills present or that may find development. *Aptitude* refers to the relative readiness to respond to training. Whereas ability may be regarded as suggesting the proficiency to create art, *appreciation* is the capacity to recognize the comparative merit of forms already created, or to recognize the comparative merit of each stage of a composition in process of development.<sup>3</sup> This latter aspect is closely related to esthetic judgment, which is the process by which an artist 'feels' his way through the countless decisions necessitated by the changing scene before him — his organization or composition. *Talent* may be regarded as demonstrated aptitude.

<sup>1</sup> Polk, Missouri. Studied by the writer and research associates, C. Tiebout and A. W. Saunders.

<sup>2</sup> Reported in *Psychological Monographs*, Vol. XLV, No. 1, "Studies in the Psychology of Art," pp. 95-107.

<sup>3</sup> Cf. definition in Achilles-Kinter Report. Psychological Corporation, 1933, p. 8.

Research has demonstrated that aptitude, skill, and capacity, and to some degree appreciation and judgment, are present in children. Capacity is probably relatively stable throughout life. Ability, as the Saunders study shows, may be retarded or accelerated, or brought out from a dormant state. Aptitude is probably conditioned by general intelligence, interests, and opportunity. Appreciation is subject to some degree of development but the exact manner of its appearance and development is not well understood.

Knauber demonstrated that considerable individual variation existed in high-school students in their responsiveness to art forms in their immediate environment, and that the presence of such forms was no guarantee of effectiveness. The Voss research,<sup>1</sup> made on children in Grades II to IV under scientific control, suggested a similar conclusion. Her subjects after five months of presentation made twice weekly of prepared experimental art exercises, designed to "induce" appreciation without instruction, gained to a small, though statistically significant, degree over a control group. She then reversed her groups and supplied instruction, with the result that the instructed group gained more in fifteen presentations than the former group did in thirty. The McAdory validation survey produced average scores by age showing a continuous increase from the ages of 10 to 19. This test measures the subjects' approximation to appreciation, or 'taste,' standard established by 100 art experts of various kinds, and as such constitutes a measure of conventional appreciation. Her consistently higher norms for women and girls possibly means that her subject matter has more appeal to that sex. The Meier-Seashore norms also show some increase in score from junior-high-school to senior-high-school level.

The ability to recognize merit in art products is subject in some degree to education. The process is conditioned by a special form of perceptual analysis and responsiveness—a kind of esthetic intelligence, which the Meier-Seashore Art Judgment test was designed to measure. A formidable body of research and other data now exists to show that esthetic judgment is the most dependable general indication of talent or probable capacity.

### 3. Artistic Ability and Intelligence

The question of the relation of art ability to general intelligence is also giving ground to scientific inquiry. The view that art is a matter

<sup>1</sup> Part of the Carnegie research program on genetic aspects of artistic capacity.

of inspiration or of feeling, "whereas science is a matter of the intellect," may well be set aside for thorough overhauling. Two proposals are well on the way toward acceptance. First, some kinds of art *can* be done by persons of low intelligence, though it is probably seldom art of a very high order. Second, good art has been achieved by individuals of high intelligence, and in this class would probably fall much of the creative type. We may therefore broach the thesis that, other things being equal, the better art products will be by individuals of at least average intelligence. The relation in question has been investigated in the extensive Carnegie program, also by Carroll and Eurich<sup>1</sup> and by Bird.<sup>2</sup> More work needs to be done, particularly in the intermediate range between the early grades and high-school levels. Most experimental work on some specific and limited phase of art, such as children's responsiveness to balance, rhythm, and unity, has shown low correlations with general intelligence. Likewise correlations of test scores on the Meier-Seashore, McAdory, and other tests with general intelligence have consistently been low.

### III. DIAGNOSTIC TECHNIQUES

#### 1. Scales

In representation failure to secure good results may be judged by the scale method through use of several drawing scales.

The Kline-Carey Scale,<sup>3</sup> Part I, provides a set of scaled drawings of a house, a boy running, a rabbit, and a tree, with interpretative comments. It is standardized with respect to scoring, but not in the manner of having the drawings made. Part II measures freehand drawing products in design and composition and includes illustrations, posters, structural design, and borders. Age and grade norms are not yet available. These scales are designed for use in the elementary-school range.

The McCarty Drawing Scale for Young Children<sup>4</sup> is similar in many ways to the Kline-Carey Scale, and covers three types of subject matter; figure, house, and composition, including trees. The test is standardized in regard to scoring. The drawings were considered "as indications of ability to express ideas vividly and accurately" rather than as esthetic representation.

<sup>1</sup> *Jour. Educ. Psych.*, 23: March, 1932, 214-221.

<sup>2</sup> Milton Bird. *A Study in Aesthetics* (Harvard Monographs in Education, Number 11, 1932, Harvard University Press).

<sup>3</sup> Johns Hopkins Univ. Press, Baltimore, Maryland.

<sup>4</sup> Williams and Wilkins Co., Baltimore, Maryland.

The Thorndike Drawing Scale<sup>1</sup> was an early form that pointed the way for the development of later scales like the above. The Providence Drawing Scale<sup>2</sup> covers elementary principles of representation, construction and design. This scale has not been offered for general use, and to what extent it has been standardized is not known.

A drawing scale does no more than a handwriting scale; it indicates to the teacher, for the kind of drawings included in the scale, the comparative ranking of the child's work with children of the general school population. It could thus disclose weakness in the child's efforts at representation and to some degree composition and design. It tells very little of creative ability or capacity. Brooks<sup>3</sup> found that ratings made without scales were one-half to one-fourth as variable as would be due to chance. A drawing scale reduces the inaccuracy by one-half of what it would be without the scale.

## 2. Ability Tests

Three sets of tests may be briefly mentioned.

The Lewerenz Test of Fundamental Abilities of Visual Art<sup>4</sup> is the most comprehensive ability test suitable for the elementary grades, since it requires certain exercises that should disclose the pupils' weaknesses. It has been standardized on 1100 children in Grades III to XII at Los Angeles. Separate norms are available for the elementary-school, junior-high-school, and senior-high-school pupils. Separate norms are also available for the separate tests, and hence make specific diagnosis of difficulties feasible.

The Knauber Test of Art Ability (originally the Knauber-Pressey<sup>5</sup>) may be available in the near future, since it has been recently republished. No standardization has yet been announced. The test must also have a feasible scoring system to meet the subjective nature of the present scoring of a number of items. It is perhaps suited primarily to the college or senior-high-school level.

The Paulsson Tests<sup>6</sup> have appeared in a restricted printing and are not yet available for use. The tests include drawing of objects,

<sup>1</sup> Teachers College, Bureau of Publications, New York City.

<sup>2</sup> Providence, R. I., Public Schools, Department of Manual Arts.

<sup>3</sup> "Relative accuracy of ratings with and without drawing scales." *Sch. and Soc.*, 27: April, 1928, 518.

<sup>4</sup> California School Book Depository, Hollywood, Calif.

<sup>5</sup> Public School Publishing Company, Bloomington, Illinois.

<sup>6</sup> Stockholm, Sweden; probably now at Upsala University, Upsala, Sweden.

completion of inventive and geometric designs, organization of graphic elements, perception of stylistic details, and completion of landscapes. Like the Knauber, this test is probably too advanced for the elementary grades.

### 3. Tests of Artistic Appreciation

The Meier-Seashore Art Judgment Test,<sup>1</sup> appearing in 1929, and the McAdory Art Test,<sup>2</sup> in 1930, represent serious efforts to provide a diagnostic tool for the analysis of artistic aptitude in the one phase of judgment that is held to be paramount among all factors contributing to success. The Meier-Seashore test is based on the assumption that problems of the artist in composition can be reduced to analogous test form and that response to these can be evaluated.<sup>3</sup> The Meier-Seashore test does not reveal fine distinctions among individuals on such a complex process but its established validity and reliability warrant due credence to its general indication of superior, average, or inferior standing. Certainly, if a superior standing is supported by a superior rating in the McAdory and other tests, and the individual shows evidence of having the necessary interest, drive, financial resources, and other considerations, definite encouragement would be in order. On the other hand, if the score is in the lowest quarter and this fact is corroborated by poor grades and by scores on other tests, together with lack of drive and limited financial resources, such considerations would stand above interest or family ambition in this direction.

The essential difference between the two tests lies in the manner of obtaining the criterion of artistic value. The Meier-Seashore used material based on works of art of considerable age, "whose artistic merits rest on a consensus of reactions having a definite survival value . . . retained . . . through many fluctuations of artistic taste. The McAdory test is based on the consensus of a group of 100 present-day art people of various kinds in respect to an arbitrary collection of objects."<sup>4</sup> Both tests have been standardized and have norms. Although the McAdory has been given in the elementary grades, both tests probably have their greater value in the junior-

<sup>1</sup> Bureau of Educational Research and Service, State University of Iowa, Iowa City.

<sup>2</sup> Bureau of Publications, Teachers College, New York City.

<sup>3</sup> For discussion see Manual, Bur. Educ. Res. and Service, Iowa City, Iowa.

<sup>4</sup> Report "The Measurement of Artistic Abilities." Psychological Corporation. Achilles and Kinter, p. 67.

and senior-high-school levels. These tests throw no light on the proficiency of the student *to draw*. They show his ability to *recognize* quality, either in the work of others or in his own work.

The Wisconsin tests, being developed by W H Varnum, include tests for observation, color-matching, color memory; static, rhythmic, and tonal balance. These are not, however, in published form.

W. G. Whitford<sup>1</sup> at the University of Chicago pioneered the use of multiple choice variations of compositions and exercises to test drawing abilities. These are described and illustrated in an article and in his book, but are not published separately for distribution. The study proved the feasibility of measuring appreciation and gradations in ability, since the tests included material relating to both appreciation and drawing ability. Although originally intended for use in diagnosing difficulties among students in the University Elementary School, they were also employed on a survey of three schools representing areas of widely separated social status in Chicago. By means of such material analysis of learning difficulties by grades can be made, as the curves of Whitford show.<sup>2</sup>

#### 4. Special Aspects

Personality traits and interests may be studied through the Strong Interest Inventory,<sup>3</sup> the Allport Ascendence-Submission Reaction Study,<sup>4</sup> the Bernreuter Personality Inventory<sup>5</sup> and the Chassell Experience Variables Record.<sup>6</sup> Results from a study by the Psychological Corporation, however, using the Bernreuter Scale on twenty-one successful artists and a large number of unselected adults did not disclose any definite differences, suggesting that among successful artists there is little of the traditional 'temperament.'<sup>6</sup>

### IV. LEARNING DIFFICULTIES IN ART

#### 1. Contributing Conditions in the Home

If progress in the classroom is retarded and little direct aid is afforded by tests, a case study technique may either indicate the cause or suggest an explanation. Since influence of the home antedates school contact, any diagnosis of poor work should include an inquiry

<sup>1</sup> *Introduction to Art Education*, Ch. XVII (Appleton). Also *Elem. Sch. Jour.*, 20: pp 33-46, 95-105.

<sup>2</sup> *Elem. Sch. Jour.* XX, p. 102.

<sup>3</sup> Stanford University, California.

<sup>4</sup> Houghton Mifflin Co., Boston.

<sup>5</sup> Rochester, N. Y. Pub by the author, J. O Chassell.

<sup>6</sup> Reported in *The Measurement of Artistic Abilities*.

into home conditions. Frequently conditions in the classroom simply reflect home conditions unfavorable to progress in art.

Questions that suggest themselves are these:

1. Is the child's normal interest in art judiciously encouraged?
2. Is there a definite belief in the 'gift' idea and hence a conviction that, since the child has not produced a juvenile Mona Lisa, there is no talent "in the family"?
3. Are the child's attempts to produce drawings and paintings ignored? Are they indirectly or definitely discouraged?
4. Is there a lack of fostering equipment in the home? Few homes have an easel of any kind. Not many have large-sized paper and tempera paint. Some of these materials, like the excellent soft colored chalk now available, are regarded by parents as 'mussy' and hence suffer a restricted use.
5. Is there a suitable place for work in the home, providing adequate lighting and other working conditions?
6. Has there developed in the neighborhood an attitude against art regarding it as a 'sissified' activity?

## 2. Contributory Conditions in the Classroom

The curriculum in art should give consideration, so far as present knowledge permits, to the following:

- 1. Are the lessons and exercises adaptable to the average esthetic age of the pupils in the grade concerned?

Experiments with children between the ages of two and twelve years proved that elementary art problems involving compositional *balance* could be sensed and responded to positively by some children as young as two years; by nearly all at five.<sup>1</sup> Exercises involving graphic *rhythm* found comprehension and positive response generally at the fifth-year level. Tests involving compositional *unity* and *fitness*, while handled well by some children at various levels, did not show up in the averages significantly until the eighth year, or third-grade level. Instruction or exercises of any kind would therefore have effective appeal to only a restricted few if introduced earlier than the third or fourth grade and would best be delayed several years more. *Color harmony*, to which positive responses are likewise found in some children at various ages, does not show significant averages until the age

<sup>1</sup> Studies in the Psychology of Art, under direction of N. C. Meier (*Psychol. Monographs*, Vol. XLV, No. 1). Studies by Daniels, C. Jasper, Whorley, and Walton. Some of these findings have just been confirmed by Voss, through a different approach.

of twelve. This would suggest that teaching is necessary before this time and that much of it cannot produce assured results.

2. Are such exercises in representation as are given fitted to the maturation level of the children taking them? Refinement of line and curves, proportion and arrangement, and also perspective, function more effectively *after* the fourth grade, as found by Whitford.<sup>1</sup>

Likewise, are materials used in supplying information about art, and procedures and materials used in developing appreciation, adjusted to the comprehension, maturation, and interest level of the children concerned? On individual judgment will most dependence have to be placed until additional research offers concrete recommendations.

3. Are the exercises based upon the natural interests of the greater portion of the children of the community?

It is quite likely that the interests of a Camden, N. J., group would be in major emphasis quite different from those of the same grade in a Camden, Arkansas, school, as they in turn would differ from one in Walla Walla, Washington. In the instance that the art teacher had her training a decade or a generation ago, has she made effort to familiarize herself with current interests of children? It may not be necessary to know a Boeing 247 from a Lockheed Vega, but persistence in patently outworn subject matter or methods does not contribute toward eliciting a child's interest and effective effort.

4. Are the lessons a reasonable challenge to the intelligence of the children?

Much paper-cutting and design has not been. Inquiry here will usually disclose a falling off of interest, if not in some cases a definite aversion.

5. Are suitable media available?

The ubiquitous colored wax crayon has limitations, just as does the pencil. Tempera paint, alabastine, and the new, soft, colored chalk are only a few of the better materials seen too infrequently by children. Plastilina and plain modeling clay could have far more extensive use than they now enjoy. Quick broad strokes that are possible with chalk on large sheets of book paper (16 x 22 or 18 x 24) may provide just the proper conditions for boys' expressions of motion in dynamic compositions. The finger painting recently featured has distinct possibilities.<sup>2</sup>

<sup>1</sup> *Loc. cit.*, p. 102

<sup>2</sup> Prang Powder, American Crayon Co., Sandusky, Ohio.

6. Is the aim of the teacher to produce a roomful of geniuses, to seek out *one* genius and glorify him before the others, or to treat all alike on a basis of no geniuses? How much is expected of the group? Of the individual? Does the continual exhibition of superior work by one or two 'talented' children provide the basis for a defeatist attitude on the part of the others, leading to apathy or even covert resentment? Motivation by adequate but reserved praise widely disseminated, a liberal instilling of self-confidence by occasional exhibits in which almost any but a lazy or very dull child has opportunity of placement, will do much to correct such a situation.<sup>1</sup>

7. Is the *end result* a foremost consideration or is the emphasis upon immediate results?

In too many schools the exhibitions assume too much importance in the teacher's planning. This may result in denying the child initiative, requiring a conformance to the teacher's stereotypes. In extreme cases the teacher may even give direct help or do part of the work herself. When later the child sets out to do something of his own, there is usually confusion. The end result should not be neglected if the student is to develop an attitude of inquiry leading to creative thinking rather than a 'pattern' type of art.

8. Is the teacher 'rabid' in viewpoint, either regarding training in technique as the sum and substance of all training, or on the other hand, permitting 'free expression' to flourish indefinitely into later years with no training in fundamentals?

### 3. General Considerations

There has been much space devoted to the question of principles in art during the past decade. The controversy is too familiar to warrant discussion, but, as in most contentions, the larger significance of the nature of principle in art is frequently misunderstood. The opponents frequently state that a picture can have quality without having principles and, conversely, have all kinds of principles and no quality. This is of little help to the art teacher. The following may be set down as guidance of a constructive nature:

1. Balance, rhythm, unity, and possibly a few others are realities in art as old as man's esthetic consciousness and are a part of man's organization. They concern environmental features that antedate primitive man: volcano (symmetry, stability); tree (symmetry); waving grass, surf (rhythm), etc.

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<sup>1</sup> Most of these conditions have been studied in the Saunders investigation.

2 These principles reside or inhere in good, satisfying works of art and are not identical with rules, maxims, canons of taste.

3. Pupils may be introduced to them as outlined earlier and as they are given to understand thoroughly that they are *general qualities* appearing in art in countless variations and that their mere presence is not alone sufficient to produce successful art or beauty. The use of principles in connection with good technique, fitting media, interesting rather than commonplace organization, are but a few of the essential considerations making for effective art.

4. A stereotyped or slavish conception of principles as *rules* to follow should not be permitted.

5. Under no conditions should the student feel that a knowledge of principles alone can assure successful art. Emphasis should be placed upon the idea that except in formal design their presence is usually something to be detected or recognized after the composition is completed.

#### 4. Conditions in the Individual

Naturally, good art work cannot usually be done if vision is not normal. Tests for visual acuity, astigmatism, myopia, or hypermetropia should be administered if there is any indication of these conditions. A suspicion of color-blindness can be settled by the Ishihara Color Blindness test or by the Holmgren yarns or Jennings self-recording test.<sup>1</sup> Low intelligence, low energy output (metabolic ratio), and similar constitutional handicaps have special means of detection that can be utilized where they may be deemed advisable.

In large schools art and crafts classes have been used for corrective and therapeutic purposes. Failing in other subjects, the dullard or 'problem case' is shunted into art. While there are certain gains to the individual possible in such practice, the tacit assumption that serious art will be produced under such circumstances can hardly be supported. This does not gainsay the general possibility of real adjustment in some cases. In the normal student, self-confidence may be fostered in the art situation by setting attainable standards of accomplishment and following this by judicious recognition. The acquisition of artistic competence is largely a matter of confidence and boldness, which can be promoted by reasonable praise.

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<sup>1</sup> C. H. Stoelting Co., 424 N. Homan Ave., Chicago, Ill.

## CHAPTER XXIII

### DIAGNOSIS IN LEISURE-TIME ACTIVITIES

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#### I. INTRODUCTION

Why should there be a separate chapter on diagnostic measurement in the field of leisure? Is leisure to be so sharply set off from work activities as to suggest a dichotomy between leisure and work? Are the problems so greatly variant that generalizations in the field of leisure cannot be safely made from the types of measurement that are discussed in other chapters of this Yearbook? The answer to the first question is 'No.' Leisure should not be set off definitely from work. As time goes on, the relationships between work and leisure will, perhaps, be much closer. They should be.

As to the second question, undoubtedly much of what has been said in the other chapters of this Yearbook, many of the techniques that have been developed in other fields, and many generalizations from other experimentation will have point here. Possibly, however, it will be necessary to develop some measures unique to the leisure field. But whether or not there is anything essentially new in the measurement of leisure-time activities, this chapter finds its justification in a new point of emphasis.

Increasingly teachers are going to ask themselves the question: What is there in this unit of subject matter, this project, or this experience that will contribute to the use of leisure time? It is clear that among the teacher's major aims is the aiding of children and youth in the development of well-rounded interests. These interests may suffer because of a lack of breadth or because of lack of intensity. It is evident, then, that we need research instruments to discover the leisure-time activities engaged in by children and young people, the intensity of their interest in these various fields, and the activities that they would enjoy but that are not now available.

## II. LEISURE-TIME OBJECTIVES

In our leisure-time activities we seek at least one major objective. Primarily, we look upon our leisure-time activities as a source of refreshment, reinvigoration, re-creation, and we evaluate them from this point of view. All activities, however, have concomitants — residues. We may not be actively seeking certain objectives, yet they are concomitant to our carrying out of the activity. Some of the most obvious of these residues are physical changes, insights, attitudes, skills, and information (or misinformation). Some readers may disagree with this analysis and consider what I have called "residues" as more important. However, regardless of relative emphasis, the measurement program will not be affected if we are careful to measure all important outcomes of leisure activities.

Very little has been done in developing measures of the primary objective set up; namely, the refreshing, reinvigorating, re-creative effect of leisure activities. It appears, however, that this is an important field in which to develop measurements. Physical condition might serve as an index of the recreative power of an activity. Tests of the relaxing effect of an activity could be developed. A cue for such tests can be found in the technique used by Renshaw for the measurement of restlessness in sleep.<sup>1</sup> Most of the other measures that have been developed so far, however, have been concerned with the pupil's verbal response as to the types of activities he enjoys and engages in. Surveys of the leisure-time activities and desires of 5,000 persons, those of business girls, and the art preferences of junior-high-school pupils are among the important studies in this field.<sup>2</sup>

## III. INTEREST TESTS

The factor best characterizing what we think of as leisure activities is free choice. Unless the pupil undertakes a project in a willing frame of mind, we have less assurance that he will enjoy the activity

<sup>1</sup> Samuel Renshaw, Vernon L. Miller, and Dorothy Marquis. *Children's Sleep* (New York: The Macmillan Company, 1933).

<sup>2</sup> *The Leisure Hours of 5,000 People*. A Report of a Study of Leisure Time Activities and Desires. National Recreation Association, 315 Fourth Avenue, New York.

*Leisure-Time Interest and Activities of Business Girls*. A Research Study. The Woman's Press, 60 Lexington Avenue, New York City.

Janet Traill and Henry Harap. "The art preferences of junior-high-school pupils." *The Journal of Experimental Education*, June 1934, p. 355.

or continue with it as an interest after he leaves school. Therefore, the preference of the individual is one of the major phases tested in this work.

Children's relative interest in, or enjoyment of, an activity can be tested by a paired comparison test.

The paired comparison technique has been adapted by Weedon of Ohio State University for use in determining the relative enjoyment of, or interest in, leisure-time activities. The pupil is presented with pairs of verbal alternatives such as "go to the movies" or "go swimming" and asked which he would rather do if the conditions for doing each were equally favorable. The activities are then scaled by figuring the percentage of pupils who chose each activity.

This technique is of value to measure almost any set of activities. For example, a chemistry teacher could discover how the interest of his students in activities related to chemistry compares with their interest in other activities and (if the pressure of grades does not invalidate the test) to measure the shifts in interests that his instruction is effecting. The technique has been used satisfactorily as low as the fourth grade and as high as the graduate school.

The actual tabulation of a test of this sort for one group of five girls is given herewith. The number of times each girl chose each activity is indicated. These numbers are then totaled and the scale

#### RESULTS OF PAIRED COMPARISON TEST

(Five girls record preferences for ten activities)

Activity	Pupil					Group Results		
	1	2	3	4	5	Total	Scale Value	Rank
Go to the movies.....	4	2	5	2	5	18	40	8
Go swimming.....	9	3	8	9	4	33	73	2
Play baseball.....	6	5	4	6	9	30	67	3
Go fishing.....	8	0	6	2	7	23	51	5
Go hiking.....	8	7	1	7	4	27	60	4
Go to a dance.....	2	4	8	5	0	19	42	7
Read a book.....	2	6	4	4	5	21	47	6
Play tennis.....	6	9	7	8	8	38	84	1
Read a magazine.....	0	1	2	0	2	5	11	10
Go to a concert.....	0	8	0	2	1	11	24	9-

value (percent of times the activity was chosen) and rank of each activity for the group is figured. It will be seen that the activity which the group as a whole liked best is "play tennis"; the one it liked least is "read a magazine." "Go to a concert" for the group ranked very low with a scale value of 24 and a rank of 9. Pupil 2, however, preferred this activity in 8 choices.

#### IV. QUESTIONARIES

Another study to discover student preferences was made by Mr. Tyler, of the Oakland Public Schools, to find out the radio habits of the pupils as well as their preferences.

Through the questionnaire method "information was secured as to the boys and girls having access to a radio in the home, the amount of time spent listening to the radio; an evaluation of various types of programs on the basis of enjoyment; the favorite programs, including a measure of the effectiveness of the advertising; favorite radio stars; and certain 'listening habits.' Data were then treated so as to find sex differences, grade level differences, and intelligence level differences."

When listening was defined as "being in the room where there was a radio in use," the average amount of time thus spent was two hours and twenty-two minutes per day. The rank of interest for the various features was, in order: short plays, variety programs, sports (play-by-play, etc.), comedy, dance music, news broadcasts, crooners, quartet (male or female), symphony, classical music (unclassified), and talks.

Is the level of diagnosis sufficiently refined? Clearly the answer depends upon the objective of the study. A greater degree of analysis would probably be needed before a remedial program could be planned. One would like to know what types of "short plays" are best liked? Least liked? It might even be desirable to compare, not types, but individual plays.

The interest tests described are based upon the student's statement of his enjoyment. It is also possible and desirable to observe the student's reactions while he is pursuing the activity. For example, if a child voluntarily repeats an activity again and again, we shall probably be justified in concluding that he enjoys this activity, provided that there is ample opportunity for him to pursue other activities, and that he has shown in other work no lack of initiative or of desire to try new pursuits. Such direct tests of overt behavior are important.

## V. SOCIAL CONSEQUENCES OF LEISURE-TIME ACTIVITIES

It is further evident that we must safeguard the choices of children and youth. Certain of their preferences cannot be satisfied because of the possible harmful social consequences that may ensue. Our major objective in leisure-time activities is refreshment, reinvigoration, and re-creation. Each activity, however, has concomitants or residues. A leisure-time activity would not be acceptable if these residues were not socially desirable. Our objective might therefore be reworded as follows: the development of ability to use one's leisure time in activities that will furnish refreshment, reinvigoration, and re-creation and that at the same time will have desirable concomitants (or at least not undesirable ones). There is need, therefore, for careful studies of the individual and social outcomes or residues of our major leisure-time pursuits.

A pattern for the carrying out of such research has been set by the Payne Fund studies of the effects of motion pictures upon children and youth. The general conclusions discovered in these studies are here presented, primarily as an indication of the broad-gauge social approach that must be used by our social diagnosticians if their studies of the outcomes of certain uses of leisure time are to bear valuable fruit. Similar studies will have to be made of reading, listening to the radio, and other leisure-time pursuits.

Studies made by Thurstone,<sup>1</sup> of the University of Chicago, in which his paired comparison tests and attitude scales were used, show clearly that attitudes are learned, reinforced, and shifted through viewing certain motion pictures.

Stoddard and Holaday,<sup>2</sup> of the State University of Iowa, were interested in discovering how much and what information was acquired from the viewing of motion pictures. Through the use of information tests they found out that children remember correctly fifty to sixty percent of what they see, and that they tend to accept as correct what they see.

The effect upon children's health of viewing the movies was in-

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<sup>1</sup> Ruth C. Peterson and L. L. Thurstone. *Motion Pictures and the Social Attitudes of Children* (New York. The Macmillan Company, 1933).

<sup>2</sup> P. W. Holaday and George D. Stoddard. *Getting Ideas from the Movies* (New York: The Macmillan Company, 1933).

vestigated indirectly by Renshaw,<sup>1</sup> of Ohio State University, in his measurement of their effect upon children's sleep.

Dale,<sup>2</sup> also of Ohio State University, studied children's attendance at the movies and the content of motion pictures. Where motion pictures are available, the average child attends once a week. The study also points out that the content of motion pictures is to be criticised primarily because of an overemphasis on sex and crime and an inadequate and unreal treatment of these and other important social problems.

How can this situation be corrected? Again the writer wishes to emphasize the fact that we cannot solve this problem by merely analyzing the reactions of individuals. A thorough-going social diagnosis is needed. Tastes inevitably are a reflection of current economic and social conditions. An adequate solution of this problem cannot be secured unless social and economic diagnosticians analyze the conditions that have brought about our current motion pictures and develop a carefully validated program for the solution of the problem.

The chief danger in our diagnostic and remedial work in the field of leisure is that we shall fail to see our problems in their social context. For example, one study shows that a far higher proportion of high-school students read *Liberty* than read *Reader's Digest*. Can one infer that this represents a lack of satisfactory taste on the part of these students? Clearly we cannot. *Liberty* costs a nickel; the *Reader's Digest*, twenty-five cents. Unless we control the factor of availability and opportunity, many of our conclusions in reading and other leisure-time pursuits are meaningless.

Accurate diagnosis of community needs should be made, so that community agencies may spend their money from the point of view of purchasing definite growths in certain fields of behavior as these relate to leisure-time tastes. Without adequate measurements of this type we shall continue to be very wasteful of our recreational expenditures.

## VI. THE SCHOOL'S PART IN IMPROVING LEISURE-TIME ACTIVITIES

In the meantime, however, the school does not need to be idle. We do know that the development of critical judgment, skill in interpret-

<sup>1</sup> Samuel Renshaw, Vernon L. Miller, and Dorothy Marquis. *Children's Sleep* (New York: The Macmillan Company, 1933).

<sup>2</sup> Edgar Dale. *The Content of Motion Pictures, combined with Children's Attendance at Motion Pictures* (New York: The Macmillan Company, 1934).

ing experience, techniques of evaluating the consequences of choices, are generalized techniques that have application in all fields of life, whether in work or leisure. We can, then, begin applying them to the motion picture, radio programs, reading, and other fields.

### 1. Diagnosis in the Field of the Motion Picture

An example of the application of diagnostic and remedial techniques to the motion picture may be mentioned, because it is well under way and the procedures can be easily adapted to other leisure-time activities. The test of enjoyment was secured by a rating scale developed by Frutchey and others of the Bureau of Educational Research at Ohio State University. It is a diary form on which the child rates each picture that he sees on an eleven-point scale ranging from the "worst I have ever seen" to the "best I have ever seen." This same type of diary record could be utilized with reading materials and with the radio. Such records, kept over a long period of time, would furnish an interesting picture of developing tastes.

But it is also evident that to increase enjoyment and to insure favorable residues of experience, other objectives must be set up. There is no assumption in this set-up, however, that the objectives are to be attained by an isolated, highly specialized method of teaching each objective independently. Setting up the objectives in this fashion is in itself a diagnosis and aids in collecting evidence of how well these outcomes are being reached. The objectives were formulated in such a way as to identify the variant kinds of behavior desired in high-school pupils. A complete statement of the series suggested for the field of motion pictures is here included as they were formulated by Frutchey. Most of these objectives are equally applicable to other fields.

#### *1. To teach high-school students to be familiar with the more dependable sources of information about current motion pictures.*

How can we diagnose the high-school student's knowledge of sources? One method is to use an unsuggested recall test by which the pupils write down the sources of information. The sources of information to which we refer are parents, teachers, advertisements, picture magazines, and so on. A list of sources may be presented to the students, who will indicate the ones from which they can obtain information about current motion pictures.

#### *2. To develop among high-school students the habit of consulting the more dependable sources of information about current motion pictures.*

A student may know the more dependable sources of information about current motion pictures but may not regularly consult them. Here we have first the problem of constructing valid paper-and-pencil tests on ways of finding out about the motion pictures and the frequency with which these sources are used. For example, two of the possible sources of information about current motion pictures are the parent and the teacher. High-school students indicate on the tests that they almost never get information about movies from these sources. Interviews with teachers and parents indicate that this statement is a correct one.

*3. To make high-school students conscious of desirable standards for motion pictures.*

Here we are interested in discovering first of all the standards that the high-school student is now using. One way to secure them is by asking him to write a list of standards. A device that we have found effective is to say, "If you were asked to write a motion picture review, what would you write about? Acting is one example." Our diagnosis shows that standards commonly used relate to the acting, the story, the plot. Standards rarely mentioned are dialog, sound and musical effects, direction. At this point the level of diagnosis may be carried much further. For example, reactions to the story may be secured in regard to its coherency, its clarity, consistency, speed of movement, plausibility.

*4. To develop among high-school students the ability to select the standards most appropriate for evaluating specific pictures.*

One way of checking this ability is to present to the student a master list of important standards. He is then asked to indicate the relative importance of these standards in evaluating given pictures.

*5. To develop skill in applying standards to particular pictures.*

Evidence concerning the achievement of this objective could apply in two different ways: First, one in which the standards were presented to the student and he was merely asked to use this list of suggested standards. A second, and perhaps more valid, measure is one in which he used standards that he remembers without any written aids.

This test can be applied in such a way as to give us merely the end product of the evaluation as, for example, in a paired comparison test utilizing motion pictures the student has seen. He sees "Cavalcade" this week and compares it with "Tom Sawyer," which he saw last week. Next week he sees "Alice in Wonderland" and compares it with each of the other pictures. Every later picture is then compared with each previous picture. The end result is a list of pictures ranked according to his notion of their merit.

A more detailed test of skill in applying standards is one in which

appropriate standards are made available to a student and in which he then rates a specific motion picture on how well he thinks each standard is met in the picture.

*6. To develop among high-school students the habit of using appropriate standards in evaluating motion pictures.*

It is evident that the habit, and not merely the skill, of using appropriate standards is what is desired. Here unsuggested evaluating comments on each picture, comments from interviews or from written reviews, may be tried.

*7. To develop among high-school students preference for pictures which more nearly meet appropriate standards.*

How does this differ from Objectives 5 and 6? It is evident that a person may have skill in applying certain standards, may have a habit of applying them, but may not have a preference for such pictures. A paired comparison test or a point rating scheme is valuable here.

*8. To develop among high-school students immunity to extreme emotional reactions and undesirable attitudes commonly produced by motion pictures.*

A selection test by which the pupils indicate the statements describing feelings they had when they saw particular scenes in specific motion pictures is being tried. This device is then checked by observation of the students during the scenes, and by listening to their conversation and talking with them after the show.

*9. To develop among high-school students the ability to suggest methods for improving specific pictures.*

It is questionable whether this objective is sufficiently important for this experiment to justify developing a separate test for it. If such a test were developed we should want to prepare a short-cut device that would give results similar to the unsuggested proposals of the pupil.

*10. To develop among high-school students the ability to discuss motion pictures intelligently.*

This objective includes both the knowledge about motion pictures necessary to discuss them intelligently and the art of conversation required to carry on effective discussions. The tests for the other objectives will probably cover the informational aspect of this objective. It is doubtful whether the development of the art of conversation is a sufficiently direct objective of the experiment to justify preparing a specific test for it.

*11. To develop on the part of high-school students a realization of the influence of motion pictures.*

A list of twenty-four scaled statements representing attitudes favorable and unfavorable to the use of motion pictures as social in-

struments has been presented to the students, who checked the statements with which they agree, disagree, or are uncertain about.

## 2. Remedial Treatment in the Case of Motion-Picture Standards

The application of these various diagnostic instruments calls for remedial treatment. What shall we do, for example, when we find that standards for evaluating radio programs, reading materials, motion-picture programs lack both range and depth?

The source of difficulty may lie in several different fields. The community may not provide adequate motion pictures. This is true of a number of rural communities. We have found, for example, that certain children who have seen nothing but 'Westerns' may avoid better motion pictures. We do not often have tastes higher than our experiences. The remedial treatment, as far as these communities are concerned, lies in the introduction of better types of motion-picture programs. Remedial treatment in other cases, we discovered, could be effected only by community provision for excellent motion pictures at no cost to the child. A third type of remedial treatment needed by one child was to relieve her fear of motion-picture programs. At one time she had been greatly frightened at such a program and this fear colored all subsequent motion-picture attendances. Further remedial training was given through the reading of a textbook prepared in the field of motion-picture appreciation. It was discovered that the use of this textbook with adequate pupil participation greatly increased the range and depth of the standards utilized by pupils.

We found further that only a small percentage of parents and teachers give guidance to high-school students in regard to their selection of motion-picture entertainment. Interestingly enough, Lewin, of the National Council of Teachers of English, found that after a period of training the percentage of children who asked for teacher assistance in picking movies rose from four to fourteen.

The few studies that have been made of remedial treatment in the field of reading, radio, and the pictures indicate that there exists a very fertile field for diagnostic and remedial work. In spite of the fact that we have commonly stated that training for leisure-time activities is one of the major objectives of education, the school has in large measure been isolated from such activities.

## CHAPTER XXIV

### DIAGNOSIS AND REMEDIAL INSTRUCTION IN CREATIVENESS

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#### I. ILLUSTRATIONS OF CREATIVENESS

Modern education lays much stress upon the ability called variously originality, resourcefulness, inventiveness, creativeness. These terms are not always used with the same meanings by writers on educational topics. It is proposed, therefore, to present a series of brief actual illustrations of what has been called 'creativity' by a number of school people.

One of the classic illustrations of inventiveness is Edison's development of the incandescent electric light. The steps and processes, as usually described, include his sensing of the fact that an electric light could be developed by the use of a conductor with resistance to the passage of electric current through it sufficiently high that it would produce heat and light. His early experiments indicated that the conductor would have to be kept away from oxygen to prevent its oxidation. He, therefore, developed the idea of a filament in a glass bulb from which the air had been removed, and tried many types of material from which to make the filament. Several requirements had to be met: the material must conduct electricity; it must have a relatively high resistance to the flow of electricity; it must not be destroyed by resultant heat; it must not be too fragile. After considerable experimentation, he found that the carbon filament made from bamboo splints met these various requirements most satisfactorily and it was, therefore, used in the first practicable electric light bulb. The process through which Edison went is ordinarily called 'invention.' It illustrates one form of creativity.

A child puts together pieces to form a picture puzzle that he has never seen completed. This process also partakes of the nature of creativity. The child takes the pieces, tries them with each other, moves them in his imagination, and gradually builds the whole out of the parts.

A course in Virgil affected some of the students in such a way that of their own volition they carried on some activities not formally re-

quired One girl, who had some talent in drawing, drew her concept of Aeneas and certain other characters portrayed in Virgil. She depicted Aeneas as she thought he must look to fit with his actions as recorded by Virgil. One of the other students in the same class, a boy, wrote short verses about Aeneas and other characters. In this case the two students collaborated, and the verse and the picture were presented together.

A child in the nursery school draws a picture of a train. He may have seen other pictures of trains, but his drawing is distinctively his own concept. For him it is an original product.

A fifth-grade boy had a bicycle and wanted a speedometer for it. He had been playing with a small electric motor and had read more or less about electricity and its uses. One day he told his father that he thought he knew how to make a speedometer for his bicycle. He said, "You say that a motor and a generator are really just the same thing. If you connect electricity to a motor, the motor will run something else. If you turn the motor with your hand or some other way, the motor will make electricity. Why can't I attach my motor to the fork of my bicycle, fixing it so the motor would turn when the wheel turns, run wires from the motor to an electromagnet and needle on the handle bars. The faster I went, the more electricity would be made and the farther the needle would move toward the electromagnet. Then you could drive your car along the road and tell me how fast you were going and I could mark my speedometer in miles per hour, too." This boy did not actually carry out his plan, but he did think through a procedure in a way that most persons would term 'creative.'

A well-known automobile manufacturer is reputed to use a somewhat novel method of providing for improvements in the automobile. For example, if he wished to have the carburetor materially improved, he would deliberately assign to the task an able mechanic who had had little or no specialized experience with carburetors. The reason given for the apparent disregard for the specialist in carburetors is the fact that the person who has worked a long time on carburetors may be so absorbed in the conventional type of carburetion that his imagination of new and improved types is restricted. The competent mechanic may nevertheless arrive at improvements because he views the problem from a new angle.

Paderewski composes a new number for the piano, or Irving Berlin writes a new popular song. In either case the composer makes a new combination of the elements of pitch, intensity, and time that are involved in any piece of music. In some instances the composer sets out deliberately to discover ways of producing a desired effect. In other instances, he simply gives play to his musical imagination.

## *DIAGNOSIS IN CREATIVENESS*

and produces something that is called new. Both types partake of what is called 'creativeness'.

Another situation in which creativeness is displayed by the musically trained person is the work of orchestration of a musical number that has been written, let us say, for the piano alone. The general character of the music is set by the original composition, but different musicians would orchestrate the same piece of music very differently. Each is to some degree creative in his work.

It is said that the Japanese developed the swimming strokes of their champions after a long research by the aid of motion pictures for the purpose of selecting the optimum swimming stroke. Motion pictures had been known for a number of years. Swimming had been known almost since the beginning of the human race. No one, apparently, had sensed previously the possibility of using motion pictures as an aid to the selection of the best swimming stroke. The person who arrived at this idea may be said to have shown creativeness.

A third-grade class of children was being introduced to the concept of multiplication. The teacher stimulated an interest in the development of garden plots and urged pupils to make as large ones as possible. The question arose as to whether a plot 7 feet by 2 feet was larger or smaller or the same size as one 6 feet by 3 feet. After some consideration, every child in the room, except one, said that the two plots were the same size as it was the same distance around them — 18 feet. One child, however, said that the plot  $6 \times 3$  was larger because (as he put it) if you thought of the plots in strips a foot wide, the  $7 \times 2$  plot would have two strips a foot wide and 7 feet long, or one strip a foot wide and 14 feet long; while there would be 3 strips 6 feet long or one strip 18 feet long in the other plot. Most teachers would say that this child displayed some originality and creativeness in arriving at this solution of the problem.

A junior-high-school student was failing in practically all of his work and was a general nuisance about the school. Upon investigation, the counselor discovered a very great interest in rock gardens. The boy was freed from one class and allowed to use the time for the construction of a small rock garden in one of the science rooms. This first rock garden was a decided credit to the boy. He was then asked to make a rock garden on the grounds of the school. He spent months at the work and produced a very pleasing effect. Furthermore, the boy developed much more interest in the other work of the school and had the satisfaction of success in something. This boy appears to have been creative in a special field — the construction of rock gardens.

A high-school student solves an original in geometry. He selects,

out of his experience with things geometrical, those elements that will contribute to the solution of his problems. He uses these elements in the sequence necessary to produce the desired effect. It would seem that such a student is creative in this work.

The teaching of physical education today emphasizes the creation of new patterns. Students have the opportunity to work out new games, new dances, new sports. Thus, for example, a teacher may play a piece of music and invite the students to express this music through the dance. Individual students create dance figures which seem to them appropriate to the music. Often the group as a whole then selects from among the individual figures those which seem best suited to different portions of the music and combines these figures in a dance that may be called new.

## II. THE MEANING OF CREATIVENESS

What are the common elements in these illustrations of what people commonly mean by creativeness? What generalization will define 'creativity'? Perhaps the essential characteristic of all the illustrations is that the outcome is either a new product made or a relation newly perceived. It is true also that the process is commonly accompanied by a feeling of satisfaction in the act of creation—a fact of great educational significance.

Creative activity may be considered from the point of view of the product or of the process. The product involves something new, not necessarily to the race; it may be new only to the individual. The discovery by a high-school student that the electrolysis of water yields two parts of hydrogen and one part of oxygen by volume is for him a discovery of new knowledge, and this kind of newness is significant from the point of view of the school. The satisfaction that accompanies the creative act is itself sufficient to warrant time and energy spent in school upon it. Furthermore, it seems likely that the route to products new to the race lies through the development of products new to the individual.

Creativeness may be viewed also from the point of view of the characteristics of the product. The product may have value because it is useful, or beautiful, or both. Creativeness in the fine arts, such as literature, painting, and sculpture, is ordinarily judged by the beauty of the product. Creativeness in the field of the applied arts is ordinarily judged primarily by its utility.

From another point of view, creativeness seems to be at times con-

sciously planned, at other times almost accidental. The difference in the methods used by musicians in composing new selections illustrates this point. Some compositions are produced in accordance with a definite plan, almost as buildings are built to specifications; others seem to grow without conscious intent or planning on the part of the composer.

From still another point of view, creativeness seems to be shown sometimes in the sensing of relationships and the formulation of generalization, at other times in the subsumption of minor generalizations under a major generalization, and at still other times in making new applications of known principles.

There is frequent discussion as to whether or not creativeness can exist in very many types of life activities. Traditionally, a limited number of situations have been set aside and called the creative arts; the presumption has been that there was no place for creativity in other fields of life experiences. It would seem, however, that if the essential element in creativeness is the production of something new either to the race or to the individual, then life is filled with opportunities to be creative.

### III. OBJECTIVES INVOLVED IN CREATIVENESS

Just what specific objectives are to be sought by a school that values creativity in youth?

#### 1. The Consciousness of Need for Improvement

Obviously, the first objective is the awareness that something better is possible.

Deutsch<sup>1</sup> developed a test of conformity which gets at the degree to which a person is complacently satisfied with what is conventional. The test calls for the subjects "to choose the best expressions in proverbial form, the most comfortable living room, the prettiest girl, the best idea of the hereafter, etc. The alternatives were chosen from various civilizations and cultures. The score depends upon the extent the individual finds his own culture always the best form."

One condition precedent to creative activity may then be the perception of inadequacies and imperfections in one's environment; in other words, a consciousness of need for improvement.

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<sup>1</sup> Gladys S. Deutsch. *Conformity in Human Behavior* (unpublished master's essay, Columbia University, Dept. of Psychology, 1923).

## 2. The Desire to Create

A second objective to be sought is the *desire to create* something. Like all objectives that partake of the nature of attitudes, this is a difficult one to attain. Perhaps the school will find it helpful in this connection to use the technique of the expert in advertising.

If one were to pay a large sum to a first-class advertising firm to make American children desire to be creative, how would the firm go at it? If one may judge from the procedures followed in making the youth of America desire to smoke cigarettes, the basic psychology would be to arrange situations whereby children would associate creativeness with honor, fame, money, and all the other rewards dear to the human heart. Pages of advertising would be placed in the readers, arithmetics, and children's magazines. These advertisements would perhaps give testimonials from prominent men and women who are much admired, telling how important they consider creative activities in their own lives. Another possibility would be to show pictures of children carrying on free creative activities under the most pleasant possible conditions.

But the approach used more commonly in the schools is the provision of exploratory experiences that satisfy and thus lead on to desires for further activity in the field. If a child makes a crude model airplane, he feels a glow of satisfaction, especially if others approve it. He is more ready for further similar efforts and may gradually build up a strong desire to create.

## 3. The Ability to Carry Out the Necessary Steps

A third objective in teaching the habit of creativeness is the ability to carry out the sequence of steps which are included in most creative acts.

The first of these is the *ability to sense the problems* that exist in situations. Certainly this is essential to any planned creation of useful objects or discovery of useful relations. Leverrier and Adams could never have predicted that Neptune must exist if they had not been alert to the problem set by the orbit of Uranus.

A second stage in the consciously planned creative act is the *preparation of a plan of action*. The place of this step is obvious in all situations where there is an objective product. Planning, however, is no less important in the situation where the outcome is a concept.

The third stage in the creative act is the *collection and selection of*

*necessary materials* and the use of them in carrying out the plan which has been developed. Control over the ability to carry out plans is clearly to be secured through practice in the execution of plans. If the school honestly seeks initiative and originality in creative production, opportunity must be given children and youth to practice producing things and ideas that are new, and the school dare not frown on their products if they are unconventional.

The fourth stage of the creative act is *self-appraisal*; the critical evaluation made by the person who did the creating. Much of the objection raised to 'activity programs' would be obviated if adequate attention were paid to the development of the children's ability to appraise their own products. The mere production of something new without any effort to judge its effectiveness in terms of the purpose for which it was designed is of but little educative value. The school needs consciously to develop in the child the ability to evaluate his own productions in creative work as well as in other areas of school activity.

#### IV. DIAGNOSIS OF CREATIVENESS

The essential element of diagnosis as applied to the teaching of creativeness is the same as applied to other educational fields. Diagnosis implies that the teacher is concerned with individual children rather than with the mass. She observes the individual pupil at work, tries to analyze what lies behind his successes and his failures, endeavors to discover his needs, and then helps him to meet them.

It should be noted that diagnosis and remedial treatment are very closely related and should not be separated too completely. The tendency in social case work, for example, is to consider diagnosis and treatment as but two complementary aspects of a continuing process. The educational case-worker may well adopt the same general principle, particularly in matters like creativeness, in which the whole life experience and personality of the client are so closely related to the objective sought.

Procedures for diagnosis in creativeness cannot be given in much detail yet, because the patterns of difficulty are not clearly known; all that can be done is to suggest fruitful lines of approach.

##### 1. Study of the Class Situation

Although diagnosis is fundamentally an activity to be carried on with individuals, yet the individual child is part of a class, and, as such, is subject to influences in common with other members of the

class. The teacher who seeks to develop creativeness may well raise such questions as the following regarding her general organization and procedure with the class:

Is the organization of the time schedule during the school day such as to permit creative work on the part of individual children? If rigidity of time allotments is characteristic of the class (arithmetic 'time' for arithmetic problems and nothing else), little encouragement is given to creativeness.

Am I using the space facilities of the school in a way to permit creativeness? Are there small unused rooms in the school available for special activities by individual children largely under their own direction and control? Can space be set aside on the school grounds for children interested in gardening?

Is equipment available that will permit the conduct of creative activities? Are there work tables, sinks, stoves, etc., that may be used by children, or can they be secured? Are pupils given access to materials, like paper, wood, wire, paste, etc., they may need? Is there a collection of books that may aid children in creative work? Are pupils encouraged to find outside of school, or to develop, the materials they may need? Are there facilities for displaying the completed products? Is there a school publication in which creative writing may be put in relatively permanent form, and thus encourage further work of this type?

The teacher may also examine critically her own activities and ask: Am I myself engaged in the construction of new things of beauty or use? Do the children regard me as another person who is seeking to create? Do I encourage the questioning attitude on the part of children? Do I use this means to develop in my pupils a sensitivity to problems?

## 2. Identification of Pupils Needing Special Help

In the conventional school subjects survey tests are available for use in detecting children who have reached only a low achievement in the field. No such standardized tests are available as yet in the field of creativeness. The teacher does have available, however, two approaches: the study of records of children and direct observation in situations where creativeness is possible.

The ordinary type of school record is of little value in the discovery of boys and girls who are conspicuous for their creativeness or lack of it. School systems, however, where it is the practice to keep a kind of

log of significant happenings of individual children do have a source of valuable information.

Where such cumulative records are not available (and they will not be available in most school systems), the teacher may set up situations that would permit creativeness to be demonstrated by the children, then watch and record what happens. For example, a science teacher may allow the children to go into a laboratory without having all the requisite equipment and material laid out in readiness for use. Some pupils, perhaps many pupils, will quickly discover the needs and proceed to secure whatever is required. Even such a brief observation may indicate which children are the more creative. Similarly, the teacher may set aside an occasional brief period during the school day when children are free to plan and carry out activities of special interest to them. Children who have already developed some degree of creativeness welcome such opportunities and use them to the full; others do nothing, and presently ask to be told what to do. It is these latter children who need most help in learning to be creative. This is a good place to stress the point that one basic assumption underlying this entire discussion of creativeness is that every child has in him the capacity to be creative to a degree at least. Of course, some children are creative in a much higher degree than others. But similarly large differences exist in every aspect of school work. The teacher of arithmetic is not deterred from attempting to help the poorer pupils by the fact that they do not have much ability in arithmetic at the outset. Neither should she disregard the pupils who are low in the scale of creativeness.

### 3. Case Study of Individual Pupils

Granting that the children who have the greatest need of help in learning to be creative have been identified, the next step is the intensive study of these children to the end that their distinctive needs can be discovered and met. Unlike diagnosis in reading and arithmetic, such study cannot be conducted by analyzing both the process and the product. Because of the unique nature of creativeness as an objective of school work, analysis of the product is much less significant than is analysis of the process. The product of creative work, whether it be a letter, a piece of pottery, a club of children, or an instrument for measuring the distance of ships on the sea, needs to be observed and studied by the teacher, but always as a stage of continuing development. Further, the product of a creative activity is to be judged

largely by the standards of the individual who has produced it rather than by the general type of standards such as is used in evaluating the product in arithmetic or in spelling.

One method in the study of the individual child is to discover instances of any level of creativeness on his part and to use them as the foundation on which to build other activities of a creative character. Social approval, in particular the approval of the teacher, is an important factor in developing children. If the teacher can show William that people think highly of him for having figured out a way to have both gold fish and turtles in the fish globe, he is stimulated to further efforts at creative thinking on his level.

The teacher also will seek to discover the vital interests of those children in whom she attempts to develop increased creativeness, because it seems likely that people create most naturally in those aspects of their experience where they feel the most interest. Interests unsuspected by the teacher may be brought to light. Surveys of pupil interests may be very helpful in this connection.

Likewise the teacher will endeavor to discover the special abilities and disabilities of the child. In some instances the child's 'profile' in the subtests of an intelligence examination may be helpful. Thus, one child may be conspicuously high in visual imagery although rather low on most of the other tests. The teacher may then plan to build the remedial program around strength in visual imagery. Many special abilities, however, are obviously not tapped by the conventional batteries of intelligence tests; for example, ability to sing.

The teacher needs also to discover, as far as possible, the extent to which the child has a desire to create something new. If the child appears to have no such desire, she may well inquire into the reasons for it. He may have created something in the past that was satisfying to him but was disapproved by his teacher, his parents, or his social group. Or he may have had insufficient control of techniques, so that his production was a failure — his model plane would not fly. The obvious thing for the teacher to do is either to help him set a more appropriate goal or help him gain control of the skills or information that would make attainment of his goal possible.

The teacher may need to find out also how skillful the child is in appraising the products of his own work. If he is not growing in power to judge the outcomes, sooner or later the appraisal made by others becomes unfavorable, and the child loses the satisfaction that he received from the activity.

### V. REMEDIAL ACTIVITIES

The first general suggestion for remedying defects in creativeness is to utilize all the situations that arise naturally in the school and that involve real problems. Every day little problems appear that will be educative to the children if the teacher does not rob the children of these opportunities by meeting the situations herself.

For example, the windows are open on a warm autumn day and a violent wind springs up, blowing papers about in the room. In many school rooms the teacher would take the responsibility for closing the windows or for directing children to close them. No learning is involved for the teacher, for it is a repetition of acts that have been performed many times. For the children, however, the situation is, to a degree, a new one and offers the possibility of a learning experience. Before long, some child will sense the problem and will take steps to meet it either by closing the windows or by asking permission to do so. If the teacher then not only allows him to close the windows but also rewards him by giving her approval of his recognition that something ought to be done and of doing it, she is teaching in such a way as to promote creativeness in this very small sector of the field. Many such situations arise in school almost every day.

In addition, the teacher may deliberately set up situations that involve problems to solve or new things to do. For example, she may have a new child enter the room and take a seat there while she is out of the room. The children sitting near the new child have a new problem they ought to meet. If they do respond by offering the new child the book in use and pointing out the place where the children are working, the teacher may well approve of such initiative and courtesy.

Although doubtless the way to develop creativeness is to practice being creative in situations that permit it, yet there may be value in observing or reading about persons who are creative in various fields. Thus, for example, a group of children who are interested in telegraph and telephone instruments, may be taken on a special trip after school to the telephone company, there to talk with one of the electricians and watch him at work. Children may be given interesting stories about inventors and the importance of their contribution. For decades boys have read stories of great soldiers and have wanted to be great soldiers too. It may be that the same procedure can be used in developing great inventors.

A most fundamental element in remedial work is the provision of satisfaction to the child whenever he gives evidence of some increase, however slight, in creativeness. There can be no real development of the creative impulse without a growing satisfaction on the part of the learner.

A further need in the development of creativeness in individual children is the provision for periods of interpretation that will result in generalizations about the production of new ideas and new things. Children can experience only a limited number of instances of creative work; yet they need to appreciate the place of invention and originality in every aspect of life. There should be occasional opportunities for children to pool their experiences with invention and arrive at generalizations about the types of problems that are of greatest importance and the methods that are effective in producing new things and new ideas. The teacher may well make special provision also for the development of the ability to transfer widely the desire and the ability to create. The development of creativeness among children in as many fields as possible is a major objective for the teacher.



## *SECTION V*

### **ADMINISTRATIVE ASPECTS OF DIAGNOSIS AND REMEDIAL INSTRUCTION**

Section V discusses some of the practical aspects of the administration of an efficient program of diagnosis and remedial instruction. Because of the rapid developments in the field of diagnosis, it is important that adequate provision be made to incorporate the results into the instructional program as rapidly as they are made available. This demands effective educational leadership. It demands that the necessary steps be taken by administrators to make available to instructors the necessary tools and equipment. The need of including in the program means of considering all aspects of the personality of the learner may in many systems require the introduction of specialists in behavior problems, social control, clinical diagnosis, and the like. In a real sense every school system can well become a center of research and study of questions related to educational diagnosis.

## CHAPTER XXV

### THE ADMINISTRATION OF A PROGRAM OF DIAGNOSIS AND REMEDIAL INSTRUCTION

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#### I. LEADERSHIP

The essential requisite of administration, here as elsewhere, is capable leadership. Such leadership is based, first, upon a genuine appreciation of the significance and possibilities of diagnostic and preventive education, and second, upon an interest and resourcefulness adequate to get results even in the face of obstacles. Since educational programs designed for the pupil who cannot profit by regular instruction will be met frequently by various forms of opposition, often the first step will involve obtaining appropriate legislation to authorize adequate measures. Special courses in some cases will be looked upon as 'fads and frills.' The frequently higher costs of education adjusted to individual needs are apt to draw fire from taxpayers. The most basic of all the obstacles, however—the inherent difficulty of obtaining worthwhile results from pupils who for the most part have already been labelled as failures—is the *real* issue. Genuine leadership will recognize only this. Once it is established that there are methods by which pupils, many of whom have been classed as failures all their lives, can be given an effective education, and that proper measures will prevent or reduce the number of such cases in the future, the vigorous and forceful leader will allow nothing to prevent him from setting up and carrying out the requisite types of programs.

This Yearbook, with its rich contributions of practical suggestions from the standpoint of many specialists, is *prima facie* evidence that it is possible to provide a type of education that will not only relieve or cure maladjustments of many pupils in the schools, but that, when comprehended and observed, will also *prevent* in large measure the continuance of the present shameful list of pupils who are called failures. For while many school systems provide special classes for atypi-

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<sup>1</sup> In collaboration with Dr. Angela M. Broeuing, Baltimore Public Schools.

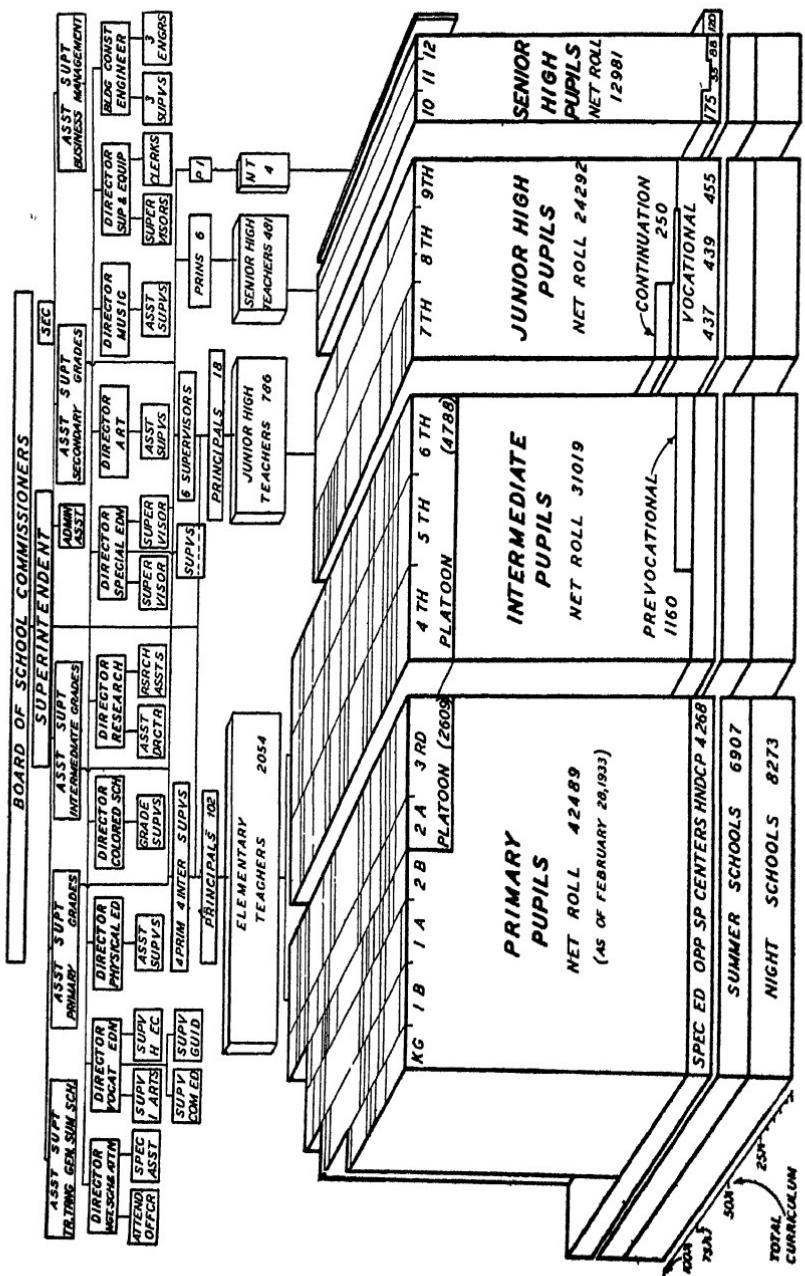


FIGURE 1.—ORGANIZATION OF PERSONNEL IN A CITY SCHOOL SYSTEM

cal children, emphasis too often is placed on the problem of how to salvage pupils who are already in trouble. The far greater and ultimate purpose should be the development of means for keeping pupils out of trouble, for preventing maladjustments. This involves greater acuity, insight, alertness, and professional skill on the part of every teacher, and a full appreciation of the situation by the superintendent and other administrative officers.

American public education is committed to the policy of providing equal educational opportunity for every child, and it is supported on that basis. The traditional hypothesis upon which early schools were based — that children were alike — is faced by the primary outcome of three decades of research — that wide individual differences exist among children of the same age. Mass education must be modified if it is to fit the wide variation among children. This fact makes trouble, but it also offers great inspiration and promise. Despite much lip service to the contrary, there is an insidious and constant tendency toward a levelling process in the thinking of too many school administrators.

## II. FUNCTIONAL ORGANIZATION OF PERSONNEL

Dynamic leadership operates in large measure through the functional organization of personnel. This is as necessary in facilitating diagnostic education as in carrying out any other purpose. The effective superintendent of schools knows that the first problem is that of developing a common philosophy among the persons who are to carry out his program. An important means of achieving this purpose is through meaningful staff conferences concerning empirical and experimental evidence of the success or failure of the educational programs planned and carried out coöperatively by the various members of the school system. One of the important functions of a board of superintendents is so to arrange working conditions that the rest of the personnel are provided with time and opportunity to carry on diagnostic education for all types of pupils.

The significance of functional assignments of personnel and the articulation of their services that are essential in a successful program of diagnostic and remedial education may be visualized by specific reference to the organization of one city.<sup>1</sup> Figure 1, represents the cus-

<sup>1</sup> Baltimore 1933 figures: For rural school organization charts, see O. L. Hatcher and E. N. Ferriss. *Guiding Rural Boys and Girls* (McGraw-Hill Book Company, 1930), pp. 204-209.

tomary relationship of superintendent, assistant superintendents, directors, supervisors, principals, and teachers to pupil population. The effectiveness of any program of diagnostic education depends not upon the effort of any one officer, but upon the existence in every officer and teacher of a common concept of its possibilities. In organization, the trend is unmistakably toward more and more different *kinds* of classes and kinds of groupings within classes. The training of teachers, both in training school and in service, becomes of increasing importance. Definite testing and teaching techniques, such as are described in this Yearbook, are the *sine qua non* of diagnostic programs. In all this, well-directed coöperative efforts are the secret of success.

An example of the effectiveness of the functional organization of the school personnel for educational diagnosis is recorded in the Ninth Yearbook of the Department of Superintendence. Committees representing all levels of the school system in several cities analyzed the factors involved in the most acute promotion problems, planned procedures for differentiating instruction according to the needs of pupils, and experimentally determined the growth of pupils with whom teachers used differentiated materials and procedures. Five hundred fifty superintendents over the country urge upon the profession educational diagnosis when they state as major factors in acute promotion problems: (1) low mentality and overage cases, (2) need for better educational service for super-bright pupils, (3) lack of differentiated courses to fit the needs of pupils of different levels of ability, (4) standards kept definite yet flexible enough to care for needs of individual pupils, (5) something to do with the pupil who fails in the same subject successively, (6) reduction of failures in the first grade, and (7) detection of unreadiness for reading before pupils are admitted to the first grade.

Fifty-five supervisors,<sup>1</sup> representing twenty-five states and all branches of supervisory service, list as the means by which teachers may reduce pupil failure:

1. Using achievement and diagnostic tests in each subject, followed by special help and remedial work.
2. Giving individual attention to pupil needs and interests.
3. Grouping according to ability, providing differentiated courses of study, and applying teaching methods suitable to each ability level.

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<sup>1</sup> *The Department of Superintendence, Nat. Educ. Assoc. Ninth Yearbook: "Five Unifying Factors in American Education."* February, 1931, 56-59.

4. Diagnosing reading difficulties of individual pupils and giving remedial treatment.
5. Providing thorough, purposeful, and motivated drill for accuracy.
6. Giving individual instruction.
7. Applying flexible promotion standards.
8. Arranging periods for special help for pupils.
9. Having pupils keep their individual records of achievement.
10. Giving immediate attention to low grades, diagnosing difficulties at time when best results for improvement can be brought about.

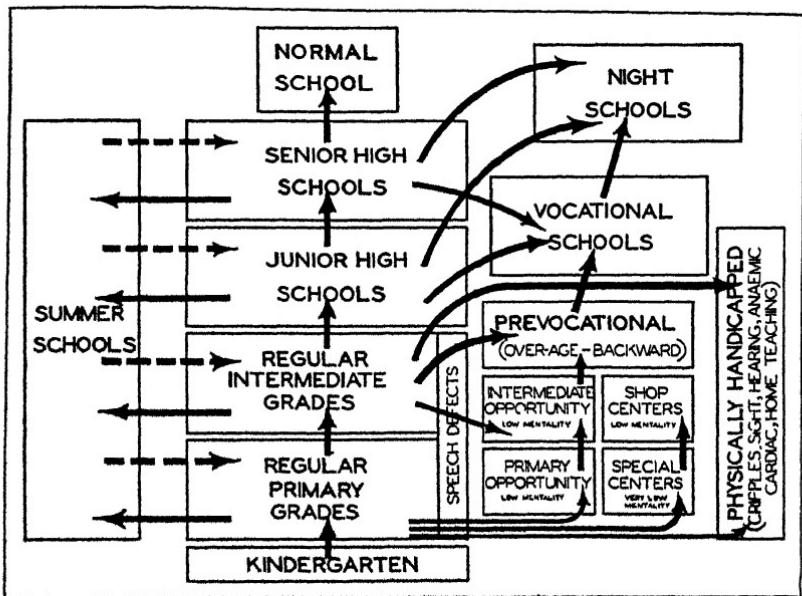


FIGURE 2.—EDUCATIONAL PATHWAYS THROUGH THE SCHOOLS

Checking on all failures at the end of each report period and not waiting until the end of the term.

11. Assuming a definite responsibility for pupil failures.
12. Helping pupils to eliminate speech defects or language difficulties.
13. Giving slow pupils more time.
14. Making trial promotions.
15. Referring difficult cases to psychiatrist for clinical treatment.
16. Administering preliminary tests, before pupil elects subject.

Two reviews of the American Educational Research Association — *Educational Tests and Their Uses* (February, 1933), and *The Curriculum* (April, 1934) — reveal the growing movement toward diag-

nostic testing and teaching. Part II of the Twenty-Fourth Yearbook of this Society, *Adapting the Schools to Individual Differences*, records several plans whereby diagnostic education can be administered. Monograph No. 13 of the National Secondary Survey, *Provisions for Individual Differences, Marking and Promotion* (1932), surveys and evaluates present practice throughout the United States. The six provisions regarded by principals as being most effective were (1) homogeneous grouping, (2) the Morrison plan, (3) opportunity rooms for gifted pupils, (4) differentiated assignments, (5) the contract plan, and (6) opportunity rooms for slow pupils. Throughout this monograph, definite suggestions are available to administrators seriously working toward more effective diagnosis and remedial instruction.

Effective administration that is to provide fully for education based on diagnosis must move toward an increasing number of pathways through the school system, so that every type of pupil may, in fact as well as in name, receive an equal opportunity. Figure 2 shows in schematic form pathways through typical school systems. But as this Yearbook points out, there is need for greater variety of courses and classes than has as yet been attempted.

### III. DIAGNOSTIC SERVICES OF THE RESEARCH DIVISION

The research department, or whatever personnel performs its functions, may well be made the central agency in the program of diagnostic education. This department stimulates, directs, and coördinates individual and group studies in educational diagnosis. It administers city-wide testing programs, interprets data for classification and instructional purposes, analyzes relevant research studies made locally and elsewhere, sets up experimentally controlled investigations of learning difficulties and of sources of effective motivation, and provides bases for appropriate records of pupils' progress.

Unless teachers, principals, supervisors, and superintendents all are a part of a research program, its fruits are not apt to be great. Hence in such programs, primary stress must be placed upon including teachers and principals in the plans. Testing and other programs should be not so much imposed from above as developed from below. Many important reforms in teaching techniques and in organization of schools or of classes are evolved through conferences, meetings, reports, and discussions in which the research bureau plays a leading part. Thus new procedures, while often the direct outgrowth of a research pro-

gram, when skillfully administered, frequently evolve in a form wherein all who have taken part are so well inoculated that the origin of the virus may be forgotten. The net effect is infinitely greater than if the research bureau's activities are confined to the four walls of a research laboratory and mere test results are announced by it as its findings.

In such bureaus, one chief interest of necessity lies in the learning process itself and in the improvement of instruction. While it should by now be obvious to all that there is no improvement in instruction unless there is improvement in learning, yet many still seem to miss this point. This conviction has led in many cities to the present programs of city-wide surveys of the results of teaching, which should serve as a most important first step in diagnostic studies within the school system. Test results in the basic subjects provide fundamental data for continually improving both administrative policies and teaching as the point of departure for diagnostic education. Such programs are in effect in most of the larger cities, among which Detroit, Providence, and Baltimore are examples.

To make this description more specific, illustrations may be drawn from the work in Baltimore with which the writer is most familiar. Here a great deal of very valuable testing work is done semi-annually by the regular faculty in each school. Some 150,000 tests are given each term. Every pupil in the elementary grades and most high-school students are tested at least in *some* subject each term, generally in at least two. This has been accomplished through a plan of organization in which one teacher in each school has been selected to act as local primary examiner and one teacher to act as local intermediate examiner. These teachers have been gradually trained by the Bureau of Research in the precise techniques of the particular tests that are used, and although they are not psychologists, they have demonstrated that they are fully as capable of administering many of the tests suitable in the circumstances as are trained psychologists. There are at present 123 primary and 115 intermediate examiners. These teachers, closely organized under the direction of the Bureau of Research, each in direct contact with her own school, become a key to systematic investigational work. This organization of examiners is of very great importance, because through its co-operation city-wide surveys become possible with a minimum of disruption to school programs. It is now no longer necessary to depend upon sporadic individual testing projects, even though many of these are excellent in their purpose and are still being carried on. With this plan, through the united efforts of teachers, examiners, and prin-

cipals, and through adequate planning, it becomes possible to secure speedily city-wide results in a specific subject. In the light of the facts thus obtained, intelligent procedure is made more possible for superintendents, supervisors, and other administrative officers.

This program yields a large quantity of data concerning the children of the schools, on which to base diagnostic, remedial, and preventive programs. Results for every school are immediately examined by teacher and principal at the school, and remedial measures proceed at once. This may involve some regrading, changes in methods of instruction, faculty conferences, and in fact, endless attack on the items that need attention. Some maladjustments thus revealed can be cured easily by simple methods. The important point here is their *discovery*. This is one of the chief virtues of a systematic recurring testing program that accumulates test-determined data for each pupil, term after term. On the persistent cases of maladjustment, such a program throws needed emphasis. Here we get the first lists of possible candidates for special ungraded classes. All such pupils are then individually examined by specialists from the department of special education. Thus this procedure opens the door to the whole program of diagnostic and preventive education.

At the central office, likewise, results are immediately scrutinized. After each term testing, in both elementary and secondary schools, supervisors<sup>1</sup> make careful studies of the status of every class in their territory, and with the information thus in hand, go to each teacher knowing the essential problems that need attention in that classroom. Every pupil is individualized, and his strengths and weaknesses studied. Similarly for the city as a whole, the board of superintendents meets and considers the status of each grade, city-wide, in each subject from the city-wide report prepared by the director of research. Thus are available very definite, systematically recurring surveys showing weaknesses and strengths of every school in every subject tested. This provides a rational basis for the formulation of policies, the allocation of principals and teachers, the improvement of courses of study, the training of teachers in service, and intelligent administration in general.

Such a program is indeed a great network extending upward from each individual child through the teacher, principal, supervisor, director of research, to the superintendent of schools (see Figure 1). In the light of the results, it becomes possible to consider intelligently what facts, processes, and skills children fail to learn; how

<sup>1</sup> Cf Seventh Yearbook (1934), Department of Supervisors and Directors of Instruction, N. E. A. *Scientific Method in Supervisory Programs* (P. T. Rankin, chairman).

much they learn in a given period; how different types of children succeed; and in what direction others fail. This immediately makes possible studies of why pupils fail or succeed.

It must not, however, be inferred from this that all problems have thus been *solved*. These repeated surveys serve first of all to reveal some of the problems requiring diagnostic and remedial and preventive measures. The tests themselves are in need of improvement. More and better tests are needed. The administration of so large a testing program presents very real problems of how to get the work done adequately without too great a strain on the teaching force. This calls for every possible device for saving labor and for safeguarding the validity of the results. Most of all is needed greater skill among teachers in dealing with the atypical child.

Reports are available which indicate that the essential function of diagnostic education, as described above for a large city system, can be carried out in small city and rural schools.<sup>1</sup> Differences exist, of course, in the number of persons engaged in the program, the frequency and comprehensiveness of testing, and the adequacy of the school record-keeping machinery.

In several places,<sup>2</sup> state departments of education assist local communities in diagnostic education through conducting testing programs, issuing monographs, and developing courses of study that provide individualization and enrichment for pupils of varying abilities and interests. In some instances, these same diagnostic services are rendered by the educational research departments of state universities.<sup>3</sup> The Coöperative Test Service directed by Dr. Ben Wood has likewise assisted local groups and individual schools that could not have afforded to maintain independent services for themselves.

#### IV. ADMINISTRATIVE MEASURES FOR DIAGNOSTIC TEACHING

Directly based upon the services of the research division are certain administrative measures that facilitate diagnostic teaching. Among these measures (to speak primarily of our plan of administration at

<sup>1</sup> See, for example, the account of the work done at Granite, Utah, under Superintendent Kirkham, as described in *National Education Association Journal*, 18: 1929, 240-247; also the discussion of plans of work in rural schools and other small schools presented by O. L. Hatcher and E. N. Ferris, *Guiding Rural Boys and Girls* (McGraw-Hill Book Company, 1930), pp. 200-202 and 204-211.

<sup>2</sup> Maryland, Pennsylvania, Connecticut, and New York are examples.

<sup>3</sup> Iowa, Ohio, Minnesota, and Wisconsin are examples.

Baltimore), the most fundamental is the classification of pupils according to ability range as indicated by mental, chronological, and achievement ages, and according to tastes and aptitudes as indicated by electives; second is the administrative machinery for listing and purchasing materials that aid differentiation in content and method, third is the adaptation of courses of study to provide for enrichment for the bright and simplified content for the dull; fourth is acceleration for bright pupils; and fifth is slower than normal progress (deceleration) and preventive classes that save a large percentage of failure among the average and dull groups.

### 1. Classification of Pupils

Obviously, pupils' achievement, reflecting as it does an interplay of intelligence, personality traits, interests, health conditions, and learning habits, becomes an increasingly important criterion for classification as the pupils progress through the grades.

In the first grade, where no achievement record is available, mental tests furnish the first criterion for classification. This is adjusted, when necessary, after teachers have had six weeks' contact with the children.

At the primary level, the judgment of the teacher concerned is the most direct agency in making these changes in classification. Since the judgments of individual teachers often vary widely, and since individual children make different manifestations of themselves with different teachers, a definite procedure must be set up whereby several estimates of a child's ability contribute to his reclassification. This may include retesting, a conference of the principal and the present teacher with previous teachers, with the child himself, and with his parents. The primary supervisor, too, can often throw light on the subject from her wider knowledge of children and classroom conditions.

At the beginning of the 4B grade, a third intelligence test is generally given. In the fourth, fifth, and sixth grades, the factor receiving greatest weight in classification is classroom achievement. In these grades, as in the primary, the strongest pupils save another half year, thus completing the six elementary grades in five years. Pupils who lag behind and seem unable to accomplish the work of any grade in the normal time are usually sent to review school to make up their deficiencies. A few who are extremely poor in their work are obliged to repeat the work of the grade. Throughout the first six grades, pupils who give indications of subnormality are re-

ported to the division of special education. They are then tested by a school psychiatrist and, if need be, are transferred to subnormal classes.

Pupils entering the junior high schools are classified according to all available information concerning their school history. This includes cumulative records of the teacher ratings, achievement tests, and mental and chronological ages sent up from elementary schools. Separation by choice of curriculum is made when pupils enter the SB grade. Here, again, classification within each curriculum takes place.

At the senior-high-school level, as far as possible every school is organized on the principle of homogeneous-ability grouping. In the tenth grade, the grouping is on the basis of data supplied by the junior high schools. Two or three weeks after the opening of school, or immediately after the close of the first quarter, academic groups are given an objective test in some or all of their subjects. On the basis of the returns, a redistribution is made within each subject. It, therefore, often happens that a pupil will be in an 'X' group in one subject, and in a 'Y' or 'Z' group in another. The twelfth-grade college preparatory group is divided into classes organized on an achievement basis. A very definite difference in the administration of these two classes is maintained. All commercial classes are similarly grouped.

The following five special adjustments are also frequently carried out by principals to facilitate diagnostic teaching: (a) individual pupil program-making in elementary schools, which permits a pupil to get additional help in the subjects in which he is weak; (b) allowing children to continue with the same teacher for at least a year (to illustrate: at the end of two and a half years, when the accelerated third-grade children enter the fourth grade, they remain with the same teacher, who then carries on with the class the first half year of fourth-grade work); (c) classification to provide remedial *group* instruction rather than individual instruction (the bases used are intelligence and accomplishment in reading and arithmetic and yield groups as follows: pupils above in all three, pupils below in all, pupils below in reading, and pupils below in arithmetic only); (d) formation of special classes of inferior 7B pupils for whom detailed case histories are furnished teachers and on which they base their teaching content and methods of instruction; and (e) arrangement of schedules such that ability groups of the same subject and grade run parallel. This allows for regrouping of pupils by subject, to suit ability clues in each subject, without disruption of the rest of the class group.

## 2. Selection of Instructional Materials

An important administrative measure affecting the differentiation of content and methods for bright and dull pupils is the machinery set up for selecting and purchasing instructional materials. In several large cities the following plan is used. The supervisory staff is obliged to keep informed concerning all types of instructional materials. Several of the supervisors have a 'Teachers Service Bureau' that carries samples of all available materials in the field supervised. These samples are circulated among the teachers who make a study of how the use of the materials will satisfy general and specific objectives and the characteristics of the children they teach. From this study, titles of materials are recommended for listing on the annual requisition list. A limited quantity of the material is then bought. After a careful trial of it under test-controlled teaching conditions, the material is kept in the grade for which it was first recommended, regraded in the light of objective data, or deleted from the list if found inadequate. This continuous study of equipment increases the sensitivity of both supervisors and teachers to the varying needs and interests of pupils.

Two specific types of diagnostic materials, achievement tests and practice tests, must also be carefully selected. The following criteria have proved helpful to administrative officers and teachers in choosing diagnostic test materials:

1. Will the use of the test tend to center attention upon a desirable aspect of the subject?
2. Is the test a valid measure of what it purports to measure?
3. Does the test state clearly what the pupil is to do?
4. Does the test isolate the specific elements in the total learning so that a true diagnosis may be made?
5. Does the test afford sufficient repetitions of a specific item, so as to give a genuine diagnosis?
6. Does the test focus the pupil's attention on a sufficiently small unit at a time?
7. Does the material give diffuse practice on skills previously learned while it gives intensive drill on a new item?
8. Does the material utilize all relevant motives for learning the associations being fixed?
9. Are the practice tests so arranged as to be self-administering and self-corrective by the individual pupil?
10. Are the associations being drilled upon important enough to warrant their being made automatic?

11. Are the tests so arranged as to help the pupil see how near he is to the goals set up in the unit of learning and to help him diagnose where he needs to straighten out his facts and improve his skills?
12. Are the tests so constructed that the bright, as well as the average and the less than average, pupil feels an urge to perform them?
13. As a check on levels of attainments, does the test have recent, well-defined, and comparable norms with which to make comparisons?
14. Is the diagnostic material sufficiently reasonable in price to permit its use?

### 3. Adaptation of the Course-of-Study Materials

In effective administration the supervisory staff, including subject and grade supervisors, principals, and counsellors, are trained to assist teachers in discovering the teaching points and in adjusting the instructional materials and curricular offerings to the needs of pupils. In furthering the program of diagnostic education, it is desirable for the teachers, in conference with the course of study chairmen<sup>1</sup> and through experimentation under test-controlled conditions, to seek these eleven forms of adaptation of materials:

1. Decide on the goals of each unit that are attainable and desirable for bright pupils and for dull pupils, respectively.
2. Examine available instructional materials to find the books through which bright pupils may be led to discover for themselves the basic understandings in the units, and the books having an easy vocabulary and simple organization through which dull pupils may work under teacher supervision on short, simple, and definite units.
3. Determine what can be carried on by the bright pupils with the aid only of good mimeographed or printed assignments, what will need to be presented by the teacher or interpreted by him in conference with the pupils, and what flexible arrangements can be made for the teachers' supervision of individual pupils at work, rather than for his 'hearing of lessons.'
4. Write units covering several days' or weeks' work, so that as far as possible the bright pupils will get their study-aids through silent reading, will have constant reminders of the central theme of the unit, will learn through reasoning rather than through

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<sup>1</sup> *Units of Work and Standards of Attainment.* Supplement to English Course of Study, Grades 7-12, Department of Education, Baltimore, Md., 1934.

- rote memory, will use libraries freely, and will have ample opportunities for individual reports and open-forum discussions.
5. Write short units for dull pupils, so that assignments will be simple and direct. The teacher will demonstrate the procedure of work to be followed, and will have the pupils try the directions under his supervision before permitting them to study independently. With dull pupils, emphasis is always placed on developing efficient habits rather than reasoning about procedures.
  6. Select or make self-corrective, self-administered, practice materials that bright pupils can use when they recognize their need for drill on any phase of the unit. (The dull pupils are constantly checked by the teacher himself and are given frequent supplementary, easy, written and oral repetitions and reviews so that mastery will be the final outcome.)
  7. Select or make practice tests useful to bright pupils in self-checking as they progress over certain sub-units in the larger unit. Dull pupils may be checked orally or in writing by the teacher or by pupils who show mastery of the sub-unit.
  8. Study the bright pupils as they work, so as to help them diagnose their needs and safeguard them from superficiality or inaccuracies in their processes of thinking. Study the dull pupils, so as to aid them with specific directions and encouragement at each small step of progress they make.
  9. Create a new situation that will test the brighter pupils' mastery of the skills and understanding, and that will, under teacher direction, encourage the dull to review.
  10. Evaluate the unit for its teachability and its intrinsic values to each type of pupil.
  11. Require of bright pupils and of dull pupils the application in the next unit of any skill mastered in this.

The philosophy of diagnostic education has permeated to a considerable extent the scientific preparation of courses of study and curriculum materials during the last five years. Experimental centers<sup>1</sup> have facilitated the trial of instructional materials, and demonstration schools have made possible the effective introduction into school systems of improved methods of teaching; yet much remains to be done.

#### 4. Provision for Bright Pupils

At Baltimore, in certain schools a program of acceleration for children of superior ability results in a gain of one-half year in the primary grades and another half year in the intermediate grades.

<sup>1</sup> For example, Detroit, Cleveland, Baltimore.

In summer schools, provision is made in all grades from the 2B through the ninth for pupils of superior ability to gain a half year in their classification by taking the work of the summer school in its eight weeks' term.

Certain junior high schools provide for acceleration of gifted pupils to the extent of a half or a whole year. In the senior high schools, acceleration of bright pupils is achieved in four ways: (1) by providing a special curriculum that enables bright pupils to complete five years of work in four and to enter colleges with sophomore standing; (2) by permitting bright pupils to take five major subjects instead of four each year and thus to complete four years of high-school work in three or three and a half years; (3) by permitting bright pupils to take advanced work in summer school and thus to secure advanced standing in the regular session (this also enables such pupils to complete four years of high school in less than four years); and (4) by offering elective courses in English and in art for specially gifted pupils in lieu of the regular courses in these fields required of all pupils.

### 5. Provision for Dull Pupils

'Subnormal' classes care for the mentally handicapped, and 'opportunity' classes make it possible to segregate those retarded for other reasons. In the largest elementary schools, special coaching teachers help pupils make up their deficiencies in particular topics.

To illustrate, a coaching teacher may have 3B arithmetic from 9:00 to 9:30 A.M. His class may consist of three children from a 3B class who were absent when a particular topic was explained; five children from two 4B classes; four from more than one 4A class; one from a 5B class; and one from a 6B. In no instance should such a group exceed fifteen in number. From 9:30 to 10:00, this teacher may have a similar group doing 3A arithmetic. From 10:00 to 10:30, a group from different classes may be having intensive word drill on a 2A level of reading ability. And thus her day proceeds.

In certain junior high schools, entering pupils whose case histories show less accomplishment and ability are placed in special classes where the regular work is presented, but at a much slower rate—three semesters for one year's regular work. Also, in addition to the academic, commercial, and technical curriculums offered in the junior high school, a fourth curriculum is offered for backward pupils who cannot satisfactorily do the regular work of the school. This curriculum is based on (1) a reduction in the amount of subject matter, (2) an or-

ganization of practically all content into short, simple units, (3) a sympathetic, helpful attitude on the part of the teacher, and (4) individual rates of progress.

In the senior high school provision is made for dull pupils (1) by permitting such pupils, with the approval of the principal, to carry fewer subjects per year than called for in a given curriculum; (2) by encouraging them to go to summer school and make up failures of the regular session; and (3) by the coaching of slow pupils by brighter pupils.

Several Baltimore high schools are putting forth a thoroughly organized effort to supply pupils in danger of failing in certain academic and non-academic subjects with the special help needed. The entire faculty coöperates in giving this help during a special period set aside at the end of the regular school day. Special help is being provided in English, mathematics, history, civics, science, Latin, French, book-keeping, typewriting, and business training. However, in all preventive classes emphasis is being placed upon fundamentals of English, or mathematics, or both. Parents are informed when the pupil is assigned for special help and are notified when the pupil is absent from the special classes to which he has been assigned. The percentages of failures for an entire school in Baltimore using this plan during the second semester of the school year was 7.8 as compared with 11.3 for the two preceding years during which the plan was not in force.

#### V. SPECIAL CLASSES AND SCHOOLS

Most school systems in the larger cities now have some system of special classes to provide for atypical children—the physically crippled, the blind or nearly blind, the deaf and hard of hearing, the speech defectives, the cardiac and tubercular cases, and the mentally retarded. In general, the practice of forming special classes or special schools for these atypical children has proved the most practical method of organization. It has the double advantage of relieving regular classes of the burden of the pupil who does not fit, and of making possible a concerted attack on the problem of rehabilitating and training the atypical children.

According to the White House Conference on Child Health and Protection<sup>1</sup> 317 cities provide some form of special classes for subnormal

<sup>1</sup> *Special Education—The Handicapped and the Gifted.* White House Conference on Child Health and Protection (New York: D. Appleton-Century Company, 1931).

children, not including the slow groups (called 'Z' pupils, e.g., in Baltimore and Detroit) in a three-track system of classification. The findings of the White House Conference show how incomplete at present is the provision for children having specific defects, as the following figures will show.

*Number of Children in United States Having Defects<sup>1</sup>*

14,400 blind children under twenty years of age.

6,000 of these are being educated in state, private, or public day schools and classes.

50,000 partially seeing children who should be in sight-saving classes. Fewer than

5,000 of these are enrolled in such classes.

3,000,000 with hearing impaired in various degrees.

18,212 deaf children enrolled in schools and classes for the deaf.

1,000,000 school children between the ages five and eighteen who are so defective in speech that they require remedial treatment and training

60,000 of these at the present time are receiving the necessary corrective training and treatment.

300,000 crippled children;

100,000 of these need special education;

10,110 of these are enrolled in public schools and

1,480 in state hospitals and schools, and in private schools.

382,000 children who are tuberculous;

850,000 more who are suspicious cases.

1,000,000 (approximately) school children who have weak or damaged hearts;

375,000 of these have serious organic heart disease.

6,000,000 children (approximately) of school age who are malnourished. Less than

40,000 of these are enrolled in open-window and open-air schools and classes.

675,000, or at least 3 percent of the elementary-school enrolment, present behavior problems. Less than

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<sup>1</sup> *Ibid.*, pp. 5-6.

10,000 of these are enrolled in parental schools, special classes and schools.

450,000 pupils enrolled in elementary grades who are mentally retarded to such a degree that they require special education to make the most of their possibilities. Less than

60,000 of these are enrolled in special classes.

## VI. RECORDS

In diagnostic and remedial programs of education the matter of records of pupils' status and progress is inescapable. The problem is to devise really meaningful records that can be maintained with the minimum of labor. The two major requirements are to provide means for revealing as completely as possible the status of each pupil and class at, say, the beginning of each term, and to provide a permanent cumulative record for each pupil as he progresses through the grades.

### 1. Current Working Records

A convenient point of attack is in connection with testing programs. Some convenient means of summarizing and interpreting the results—of presenting the complete picture for a class—is a necessity. Among the first records of this sort were those developed by Richard Allen at Providence.

Whatever the type of record be, its general function is always the same; namely, to present test results and related information in such a meaningful way as to *arouse interest and action* on the part of teachers, principals, supervisors, directors of special divisions, and superintendents. This goal, we think we have attained at Baltimore by developing certain forms of record sheets that embody novel and effective methods of presenting data. The complete data for a class are entered by each teacher, immediately after testing, upon an original blank called the *Teacher's Class Analysis Chart*. Black and white prints are then made of each class chart by the Bureau of Research for use by supervisors, directors, and superintendents. The importance of these records is deliberately here stressed. More than anything else they have proved to be the means by which the whole concept of diagnostic, remedial, and preventive education has been developed at Baltimore. This chart shows for each individual pupil and for the class as a whole the exact rating in each subject tested, and also the rating in all subtests, together with age, grade, and teacher's marks, etc. Thus a teacher may note at a glance which pupils and which subjects need special attention. It is not exaggerating to

say that, with us, this device has become in large measure the blue-print on which the direction of the schools is based.

The Teacher's Class Analysis Chart shows in Part I distributions for the subtests and in Part II summarized distributions. It is not

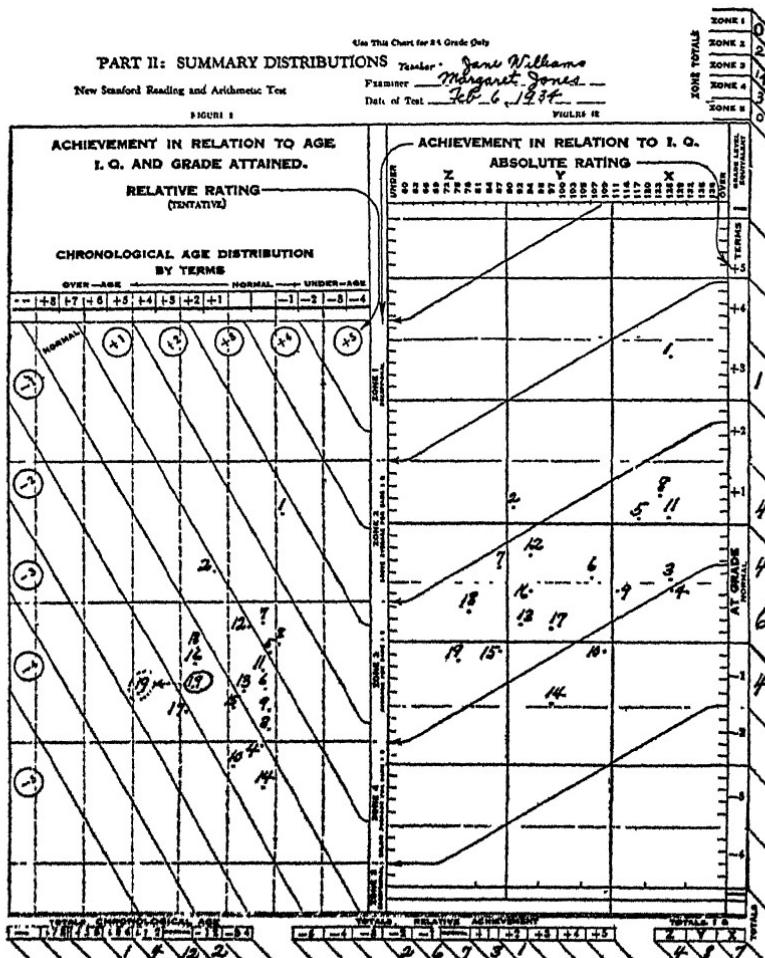


FIGURE 3.—SUMMARY DISTRIBUTIONS: PART II OF THE TEACHER'S CLASS ANALYSIS CHART

feasible to reproduce the chart as a whole within the compass of this page and retain legibility (the charts measure 14 by 27 inches), but Part II is reproduced here (see Figure 3).

This Part II is a device which summarizes and automatically interprets the total achievement of each pupil and for the class. By making only two distributions of the pupils,<sup>1</sup> it will be noted, there are afforded five classifications for each pupil; namely,

- (a) according to absolute grade level of achievement,
- (b) according to I.Q.,
- (c) according to I.Q. zones,
- (d) according to chronological age,
- (e) according to a relative rating based on all of the above factors combined.

Finally, attention should be called to the use of the summary distributions to form the *Principal's School Summary* (see Figure 4).

By the simple device of entering the totals in the lower and right-hand margins, it becomes possible to obtain a *total distribution of the results for an entire school without the copying of a single figure*. This is accomplished by merely utilizing step-up, or 'shingle,' binding of the individual class charts in which the charts when superimposed upon each other are staggered upward and to the left sufficiently to show the totals in the margin of each chart. All totals are then disclosed simultaneously in straight diagonal columns. This method has the double advantage, first, of requiring *no clerical labor whatsoever*, and second, of yielding a *summary* without sacrifice of the original data on which that summary is based, since the complete analysis chart for every class is included. This is also *absolute guarantee against errors in summarizing*. By this means a principal may quickly note, e.g., all the pupils in an entire school at each grade level of achievement, all X, Y, and Z pupils, all at each degree of overage-ness or underageness, and finally, all at each degree of relative achievement.

This chart thus furnishes innumerable opportunities for study both of individual pupils and of particular groups of definite descriptions, such as the overage, the bright, or the dull, etc. More important, it systematically combines all the data and rates all pupils uniformly on the same basis. It throws into the foreground problems requiring improved classification of children, improved administration and organization of schools, and improved instructional procedures for caring for individual differences of pupils.

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<sup>1</sup> An account of the methods by which entries are made and data speedily handled in the chart has been omitted for lack of space. The editor assumes that Dr Stenquist will be glad to supply this and other pertinent information to administrators interested.—G. M. W.

## 2. Permanent Cumulative Records

Some form of cumulative permanent record for each pupil is of particular importance for his educational guidance through the grades. The outstanding work that has been done on cumulative records is probably that of the American Council of Education and of the Edu-

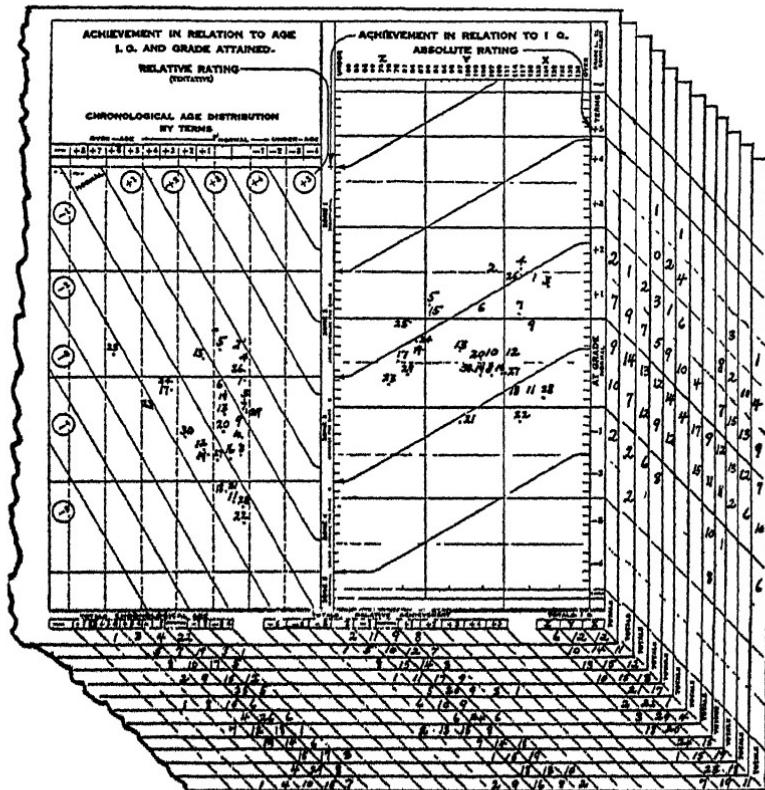


FIGURE 4.—PRINCIPAL'S SCHOOL SUMMARY

cational Records Bureau of New York under the direction of Dr. Ben D. Wood of Columbia University. The American Council Record consists of a large  $8\frac{1}{2} \times 11$  double card giving 99 kinds of items of information, arranged in progressing chronological columns. It includes cumulative test results, expressed in comparable units, shown as curves of progress. Combined with these are the teachers' marks, and many personal characteristics of the pupil. There is no question of the ex-

cellence of this record. Were it not for the considerable amount of labor connected with its use, it should be recommended at once without question. It seems altogether likely, however, that such truly excellent records must become ultimately a part of any really adequate program of diagnostic education and that adequate record-keeping will have to be recognized as an integral part of every teacher's job.

### VII SUMMARY OF CRITICAL ISSUES

In the light of the empirical and experimental data presented in this Yearbook, the fundamental administrative problem is how to gain a clearer definition of the real aims of the educational program, so that the entire school personnel and the lay public may work together to protect the child from conditions that will cause maladjustments. It is essential that diagnosis be made in connection with objectives that are worth while and integrated with a good educational program.

The diagnostic goal brings out the necessity of developing more precise and objective measurements, including observations, interviews; case records, and collections of products of pupil learnings, along with the well-established types of educational and mental tests. The ultimate success of the school's efforts at diagnostic education will depend not merely on the non-interference of parents and of the public, but on their actual coöperation in securing legislation, financial support, and sympathetic public opinion. It is urgent that, in the effort to make education diagnostic, the administrator guard against lack of balance in the educational program because of vested lay interests or because certain types of diagnostic materials are readily available while others are not.

The most acute problem, however, lies in the teacher-training program. The key person in diagnostic, as in all other education, is the teacher. The teacher must be able to take an objective view of herself and of the problem child whose behavior difficulties she is diagnosing and to use well-selected instructional materials to help correct the child's attitude. Though there is no reason why the professionally trained teacher should not know how to diagnose the most common types of learning difficulties, she does equal service when she recognizes the need of applying to the specialist for clinical diagnosis. The teacher-diagnostician of tomorrow requires pre-training and post-training to carry out the implications of a genuine program of diagnostic education.

The importance of an administrative procedure for carefully se-

lecting instructional materials is clear. Since all instructional materials are not efficiently constructed, since most practice exercises have been organized in such a way as to make no provision for variations in the rates of pupil progress, since there is a lack of materials for enrichment, since some materials force an intensive rather than the preferable extensive treatment, since materials are often too difficult for pupils, since books and practice tests are often printed in too small type for the child with sight difficulty, and since the materials are not always planned with respect to the maintenance of skills—for all of these reasons, the selection of instructional materials is a serious administrative problem. Clearly, a development in diagnostic education means the development of a rich quantity of new materials designed by specialists in this field.

The discussion of worth-while aims and satisfactory materials of instruction, including all sorts of visual materials as well as books, raises certain curricular problems that are critical issues for the administrator. Among these are time allotment to subjects and to phases of subjects, class size, grade placement of materials, and time allowed to teachers for diagnostic testing of all kinds.

Equipment for diagnostic testing and for storing instructional materials is an essential budgetary problem that the administrator must face. The administrative machinery for school record-keeping largely controls the adequacy of the information necessary for intensive constructive, preventive, or remedial work.

While the problem of diagnostic education thus leads into an intricate maze of detail and calls for serious scientific study of a multitude of problems, there is nothing essentially mysterious about it. From the standpoint of administration, as was pointed out in the first sentence of this chapter, the issue is fundamentally a matter of genuinely capable leadership based on an adequate philosophy.



# CONSTITUTION OF THE NATIONAL SOCIETY FOR THE STUDY OF EDUCATION

(As Revised at the 1924 Meeting and Amended in 1926, 1928, 1929, 1932, and 1933)

## Article I

*Name.* The name of this Society shall be "The National Society for the Study of Education."

## Article II

*Object.* Its purposes are to carry on the investigation of educational problems, to publish the results, and to promote their discussion.

## Article III

*Membership.* Section 1. There shall be two classes of members — active and honorary.

Section 2. Any person who is desirous of promoting the purposes of this Society is eligible to active membership and shall become such on payment of dues as prescribed.

Section 3. Active members shall be entitled to vote, to participate in discussion, and under certain conditions, to hold office.

Section 4. Honorary members shall be entitled to all the privileges of active members, with the exception of voting and holding office, and shall be exempt from the payment of dues.

A person may be elected to honorary membership by vote of the Society on nomination by the Board of Directors.

Section 5. The names of the active and honorary members shall be printed in the Yearbook.

Section 6. The annual dues for active members shall be \$2.50. The election fee for active members shall be \$1.00.

## Article IV

*Officers.* Section 1. The Officers of the Society shall be a Board of Directors, a Council, and a Secretary-Treasurer.

Section 2. The Board of Directors shall consist of six members of the Society and the Secretary-Treasurer. Only active members who have contributed to the Yearbooks shall be eligible to serve as directors, and no member who, under the provisions of Section 3, has been elected for two full terms in immediate succession shall be eligible to reelection to succeed himself for a third term.

Section 3. The Board of Directors shall be elected by the Society to serve for three years, beginning on March first after their election.

Two members of the Board shall be elected annually (and such additional members as may be necessary to fill vacancies that may have arisen).

This election shall be conducted by an annual mail ballot of all active members of the Society. A primary ballot shall be secured in October, in which the active members shall nominate from a list of members eligible to said Board. The names of the six persons receiving the highest number of votes on this primary ballot shall be submitted in November for a second ballot for the election of the two members of the Board. The two persons (or more in the case of special vacancies) then receiving the highest number of votes shall be declared elected.

Section 4. The Board of Directors shall have general charge of the work of the Society, shall appoint its own Chairman, shall appoint the Secretary-Treasurer, and the members of the Council. It shall have power to fill vacancies within its membership, until a successor shall be elected as prescribed in Section 3.

Section 5. The Council shall consist of the Board of Directors, the chairmen of the Society's Yearbook and Research Committees, and such other active members of the Society as the Board of Directors may appoint from time to time.

Section 6. The function of the Council shall be to further the objects of the Society by assisting the Board of Directors in planning and carrying forward the educational undertakings of the Society.

#### Article V

*Publications.* The Society shall publish *The Yearbook of the National Society for the Study of Education* and such supplements as the Board of Directors may provide for.

#### Article VI

*Meetings.* The Society shall hold its annual meetings at the time and place of the Department of Superintendence of the National Education Association. Other meetings may be held when authorized by the Society or by the Board of Directors.

#### Article VII

*Amendments.* Proposals to amend this Constitution may be made by the Board of Directors or by petition of twenty-five or more active members of the Society. Such proposals shall be submitted to all active members for a mail vote, and shall be declared adopted if approved by two-thirds of the members voting thereon.

MINUTES OF THE CLEVELAND MEETING OF THE SOCIETY  
FEBRUARY 24 AND 27, 1934

The two sessions of the Society were held in the Ball Room of the Carter Hotel. The capacity of this room, estimated at 1200, was sorely taxed Saturday evening, but on account of counter-attractions, especially in the general meetings of the Department of Superintendence, our Tuesday evening meeting was but slantly attended.

FIRST SESSION — SATURDAY, FEBRUARY 24, 1934

This session was devoted to a discussion of Part II of the Thirty-Third Yearbook of the Society, entitled *The Activity Movement*, which had been prepared by a committee of the Society under the chairmanship of Professor Lois C. Mossman.

The meeting was called to order shortly after eight o'clock by Dean M. E. Haggerty, Chairman of the Board of Directors, who presided while the following program was presented (except that Professor Kilpatrick was unexpectedly detained in New York and was unable to send his paper to be read):

I. "The Purpose and Plan of the Yearbook."

Lois Coffey Mossman, Assistant Professor of Education, Teachers College, Columbia University, and Chairman of the Committee. (15 minutes)

II. "Criticisms of the Yearbook as One in the Field Sees It."

Orville G. Brim, Professor of Education, Ohio State University, Columbus, Ohio. (20 minutes)

III. "Controversial Areas in Connection with the Yearbook."

William S. Gray, Professor of Education, University of Chicago, Chicago, Illinois. (20 minutes)

IV. "The Activity Movement from an Adverse Point of View."

Guy M. Whipple, Secretary of the Society. (20 minutes)

V. "The Essential Conception of the Activity Movement."

William H. Kilpatrick, Professor of Education, Teachers College, Columbia University. (20 minutes)

VI. General Discussion from the Floor.

Open to members of the Society. (Time limit: 3 minutes each)

For general atmosphere the discussion that followed proved quite as warm as any that has been had in recent years in the meetings of this Society. Chairman Haggerty was obliged to wield his gavel vigorously to remind certain more clamorous members of the audience that the discussion was limited to members of the Society and to remind some of our more importunate members to observe the time limits of discussion. By one means or another the storm that seemed to be progressively approaching was allayed in intensity and a satisfying, calm serenity replaced it entirely when Professor Mossman, in the last few minutes of the evening, skilfully guided the discussion to a

safe port. Thus the accusation that the entire Yearbook and the entire program had been set up by the Board of Directors to discredit the cause of progressive education was effectively contradicted by the chairman of the Society's Yearbook Committee, who had herself arranged the evening's program, and who publicly expressed her approval of it and of the attitude of the Board toward the Yearbook. Among the members of the Society participating in this discussion were Flora Cooke, Alice Kelher, Lois Mossman, and Messrs. Hosic, Merriam, Rugg, Washburne, and Whipple.

SECOND SESSION — TUESDAY, FEBRUARY 27, 1934

In marked contrast to this hurly-burly, the Tuesday evening session of the Society was a straight-forward, objective discussion of a well-defined and, if you like, relatively homely set of problems; namely, those presented in Part I of the Thirty-Third Yearbook of the Society, entitled *The Planning and Construction of School Buildings*, which had been prepared by a committee of the Society under the chairmanship of Professor N. L. Engelhardt.

Dean Haggerty again officiated as chairman of the evening, and the following program was carried out as scheduled (except that, of our invited speakers, we were privileged to hear Commissioner Zook, but not Mr. Kohn):

- I. "The Purposes and the General Plan of the Yearbook."  
N. L. Engelhardt, Professor of Education, Teachers College, Columbia University, New York City, and Chairman of the Committee. (15 minutes)
- II. "Difficulties Encountered by Superintendents of Schools and Boards of Education with Respect to Architectural Service"  
W. W. Theisen, Assistant Superintendent of Schools, Milwaukee, Wisconsin. (15 minutes)
- III. "Major Problems in the Supervision of School-Building Construction."  
R. L. Hamon, Professor of Education, George Peabody College for Teachers, Nashville, Tennessee. (15 minutes)
- IV. "The Rôle of the Federal Government in the Financing of Educational Buildings."  
George F. Zook, Commissioner of Education, Office of Education, Washington, D. C. (15 minutes)  
(By invitation)
- V. "Changed Ideals in Community Planning."  
Robert D. Kohn, Director of Housing, Federal Emergency Administration of Public Works, Washington, D. C. (15 minutes)  
(By invitation)
- VI. "Financing the School Buildings of the Future."  
Arthur B. Moehlman, Professor of Education, University of Michigan, Ann Arbor, Michigan. (15 minutes)
- VII. General Discussion from the Floor.  
Open to members of the Society. (Time limit: 3 minutes each)

GUY M. WHIPPLE, Secretary.

## SYNOPSIS OF THE PROCEEDINGS OF THE BOARD OF DIRECTORS OF THE SOCIETY DURING 1934

This synopsis, indicating matters of importance only that have been considered by the Board of Directors, is presented in order that the members of the Society may be informed concerning the acts and policies of those who are directing the work of the Society.

### CLEVELAND MEETING OF THE BOARD

Cleveland, Ohio: Hotel Cleveland, February 25.

Present: Bagley, Charters, Freeman, Haggerty, Trabue, Uhl, and Whipple.

1. The Secretary reported, as the result of the ballot in December, 1933, the reelection of Director Haggerty and the election of Professor Ernest Horn, to serve for three years, beginning March 1, 1934.

2. The programs proposed by Professor Mossman and by Professor Engelhardt for the February Society meeting had been accepted by the Board, with minor modifications.

3. The Board approved fully the statement, originally proposed by Director Charters, to be placed on the copyright page of the yearbook for the purpose of defining the responsibility of the Board and of the Society.

4. The Board approved the action of the Secretary thus far in connection with the invitation that the Secretary serve as a representative of this Society with other consultants to the Joint Commission on the Emergency in Education. The Board voted, however, that the Society should not participate further in the work of the Commission, on the ground that it was not in the power of the Board to take any action that would commit the Society to any educational movement, however worthy or however much the Directors as individuals might endorse the movement.

5. After discussion of the prospective increase in printing cost due to the transfer of about 300 associate members to active membership, the Board voted that no change should be made in the practice of printing the names of members in the back matter of each yearbook.

6. Two members of the society had corresponded with the Secretary on the question of the method of nomination of Directors, raising particularly the question whether the restrictions should not be removed that limited nominees to yearbook contributors. The Secretary suggested that a plan might be developed whereby other members of the Society might be nominated on petition of a given number of members. Having in view the fact that no concrete proposal has ever been made by a member of the Society for changing the method of nominating, the Board voted to continue the present method until some objector should present a plan for consideration.

7. Objections raised by a member of the Society to the present policy of

the Society with respect to quoting from yearbooks were laid before the Board, along with the Secretary's reply. The Board approved the Secretary's reply and concluded that no other action was necessary on this matter.

8. On recommendation of the Secretary, the Board voted that the reinstatement fee, which has for some time been one dollar, should be reduced to fifty cents, and that when the fee was assessed, a statement should be made explaining that this amount was necessary to cover the actual expenses of reinstatement.

9. The Treasurer reported informally upon the finances of the Society, showing that despite the depression, the Society's funds have not been seriously reduced and that the income from sales had shown, at the most, 20 percent reduction.

10. Director Haggerty was reelected Chairman of the Board for one year beginning March 1, 1934.

11. The Secretary and Director Trabue were appointed to represent the Society on the Council of the A. A. A. S. at its Pittsburgh meeting.

12. Professor Brueckner reported in person his plans for a yearbook on "Educational Diagnosis." The Board agreed that, in this yearbook at least, it would be inadvisable to include critical comments by persons not members of the yearbook committee. The Board further agreed that there might be given to this yearbook, if it were the only one published in 1935, 350 to 400 pages. The Board also voted to appropriate three hundred fifty dollars additional for the preparation of this yearbook.

13. Dr. Harold Rugg desired to have from the Board a decision whether the yearbook on "The Scientific Method in Education" would be published in 1936 or in 1937. He also requested an additional appropriation for use in 1934. The Board felt unable at the moment to take any action on the first point, but sanctioned the additional appropriation requested. (See also No. 25.)

14. Director Bagley was unable to supply definite information concerning the outlook for the publication in 1935 of the yearbook on "International Relations," being prepared under the direction of Professor Shotwell. The Board agreed that unless assurance could be had within ten days it should be regarded as postponed and additional space be granted to the yearbook on "Educational Diagnosis."

15. President Coffman reported that his committee had not yet arrived at a definite plan for a yearbook on "The Organization of Higher Education." He also requested the Board to continue his committee, which was done.

16. Director Uhl was appointed chairman of a committee on "Music in the Public Schools." For the use of this committee \$500 was voted and the yearbook was tentatively listed for publication in 1936. (See also No. 25.)

17. The proposal that a yearbook be prepared upon "Equipment for Classroom Instruction," at the suggestion of Director Uhl, who had made the original proposal, was dropped from further consideration because the topic had been undertaken by another organization.

18 Mr. Dinwiddie reported that he was still unable to secure a subsidy for the preliminary study felt essential to his proposed yearbook on "Education in Relation to Vocation." Director Trabue subsequently conferred with Mr. Dinwiddie, with the result that this proposal has now been definitely dropped.

19 Professor Moehlman, of the University of Michigan, suggested that the Society produce a yearbook on "Educational Accounting." The Board agreed that this topic would better be taken up by some other organization.

20. Dr. M. M. Chambers, of Ohio University, suggested that the Society produce a yearbook on the "Legal Basis of Education." The Board agreed that the topic was somewhat too technical to appeal to the members of this Society and that some other society would be a more obvious one to undertake it.

21. The Secretary suggested the possibility of a yearbook on "The Stabilization of the Elementary-School Curriculum." Discussion of the suggestion did not arrive at a final disposition of it, but it brought out other possible problems that might be considered later, as for instance, over-grading, the effect on mastery of promotion by age, etc.

22. The Secretary suggested the desirability of a yearbook on "The Social Studies in the Elementary School," but withdrew the suggestion in view of the material that was just appearing under the auspices of the National Council of Social Studies.

23. The Secretary was directed by the Board to secure from several sources comparative bids for the printing of the 1935 yearbook.

24. The Board voted unanimously that the Secretary express to Professor Mossman the Board's appreciation of the manner in which she had brought to completion the yearbook on "The Activity Program," and conducted the Society's meeting at which that yearbook was discussed.

25. There was discussion of the difficulty encountered by the chairmen of certain committees in securing contributions to the yearbooks from persons not active members of the Society. It was pointed out that precedent had been established in two or three yearbooks for including contributions from some persons not members of the Society. With these considerations in mind, the Board voted to rescind its regulation restricting membership on the Society's yearbook committees to active members of the Society, with the qualification that this annulment of the regulation shall not apply to chairmen of committees and that the chairmen shall make reasonable effort to persuade their committeemen to become members of the Society.

REPORT OF THE TREASURER OF THE SOCIETY  
FOR 1933-34

CONDENSED STATEMENT OF RECEIPTS AND EXPENDITURES FOR THE YEAR  
MARCH 1, 1933 TO FEBRUARY 28, 1934

Balance on Hand, March 1, 1933, per prior report ..... . . . . . \$20,436.66

RECEIPTS

*From Sale of Yearbooks by the Public School Publishing Company:*

June to December, 1932 . . . . .	\$4,603.31
January to June, 1933 (part) . . . . .	3,000.00
	\$7,603.31

From Fees for Quotations from Yearbooks . . . . .	66.00
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*Interest on Bonds, etc.:*

Interest on Bonds . . . . .	\$ 492.50
Interest on Savings Account . . . . .	49.75
	542.25

From Dues . . . . .	3,358.64
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Total Receipts for the Year . . . . .	11,570.20
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Total Receipts, Including Initial Balance . . . . .	\$32,006.86
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EXPENDITURES

*Yearbooks*

*Manufacturing and Distribution:*

Binding and Mats for 31st . . . . .	\$ 859.88
Printing, Binding, Distributing 32d . . . . .	7,003.25
Printing 33d, I . . . . .	3,509.01
Printing 33d, II (part) . . . . .	506.48
Reprinting 24th, II . . . . .	425.70
Reprinting 29th . . . . .	888.90
	\$13,193.22

*Preparation:*

School Buildings Committee . . . . .	\$ 252.87
Activities Committee . . . . .	284.86
Educational Diagnosis Committee . . . . .	387.93
Science of Education Committee . . . . .	518.43
Higher Education Committee . . . . .	382.57
	1,826.66
Total Cost of Yearbooks . . . . .	\$15,019.88

*Meetings*

Minneapolis Society Meeting . . . . .	\$ 214.72
Chicago Board Meeting . . . . .	164.82
	379.54

*REPORT OF THE TREASURER OF THE SOCIETY*

533

*Secretary's Office*

Editorial, Secretarial, and Clerical Services .. . . . .	\$ 2,744.01
Office and Deposit Box Rent .. . . . .	245.50
Supplies, Stationery, Printing, Postage .. . . . .	240.72
Travel .. . . . .	29.86
Bad Checks, Refunds, Bank Fees .. . . . .	29.73
Miscellaneous .. . . . .	25.64
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	3,315.46

*Investments*

Exchanging \$500 Liberty Bond .. . . . .	\$ 0.02
Interest Purchased on Liberty Bond .. . . . .	2.07
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Total Expenditures for the Year .. . . . .	2.09
Balance on Hand, February 28, 1934 .. . . . .	\$18,716.97
	13,289.89
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Total Expenditures and Closing Balance .. . . . .	\$32,006.86

**ANALYSIS OF BALANCE ON HAND FEBRUARY 28, 1934**

Balance on Hand, February 28, 1934.

Cash:

Checking Account, Danvers National Bank (\$1295.34 less \$46.02 checks outstanding) .. . . . .	\$ 1,249.32
Savings Account, Danvers National Bank .. . . . .	1,076.70
Savings Account, Danvers Savings Bank .. . . . .	1,035.61
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	\$ 3,361.63
Liberty Bonds and Other Securities, Face Value, \$10,000 at cost .. . . . .	\$ 9,928.26
Balance, February 28, 1934 .. . . . .	\$13,289.89

GUY M. WHIPPLE, *Treasurer.*

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1. PURPOSE. The purpose of the National Society is to promote the investigation and discussion of educational questions To this end it holds an annual meeting and publishes a series of yearbooks

2. ELIGIBILITY TO MEMBERSHIP. Any person who is interested in receiving its publications may become a member by sending to the Secretary-Treasurer information concerning name, title, and address, and a check for \$3.50 (see Item 5).

Membership may not be had by libraries, schools, or other institutions.

3. PERIOD OF MEMBERSHIP. Applicants for membership may not date their entrance back of the current calendar year, and all memberships terminate automatically on December 31, unless the dues for the ensuing year are paid as indicated in Item 6

4. DUTIES AND PRIVILEGES OF MEMBERS. Members pay dues of \$2.50 annually, receive a cloth-bound copy of each publication, are entitled to vote, to participate in discussion, and (under certain conditions) to hold office The names of members are printed in the yearbooks.

5. ENTRANCE FEE. New members are required the first year to pay, in addition to the dues, an entrance fee of one dollar.

6 PAYMENT OF DUES. Statements of dues are rendered in October or November for the following calendar year Any member so notified whose dues remain unpaid on January 1, thereby loses his membership and can be reinstated only by paying a reinstatement fee of fifty cents, levied to cover the actual clerical cost involved.

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7. DISTRIBUTION OF YEARBOOKS TO MEMBERS. The yearbooks, ready prior to each February meeting, will be mailed from the office of the publishers, only to members whose dues for that year have been paid Members who desire yearbooks prior to the current year must purchase them directly from the publishers (see Item 8).

8. COMMERCIAL SALES. The distribution of all yearbooks prior to the current year, and also of those of the current year not regularly mailed to members in exchange for their dues, is in the hands of the publishers, not of the Secretary. For such commercial sales, communicate directly with the Public School Publishing Company, Bloomington, Illinois, which will gladly send a price list covering all the publications of this Society and of its predecessor, the National Herbart Society. This list is also printed in the yearbook.

9. YEARBOOKS. The yearbooks are issued about one month before the February meeting. They comprise from 600 to 800 pages annually. Unusual effort has been made to make them, on the one hand, of immediate practical value, and on the other hand, representative of sound scholarship and scientific investigation. Many of them are the fruit of coöperative work by committees of the Society.

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